

Rhodora

JOURNAL OF THE
NEW ENGLAND BOTANICAL CLUB

Conducted and published for the Club, by

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Vol. 48.

November, 1946.

No. 575.

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The New England Botanical Club, Inc.

8 and 10 West King St., Lancaster, Pa.

Botanical Museum, Oxford St., Cambridge 38, Mass.

RHODORA.—A monthly journal of botany, devoted primarily to the flora of the Gray's Manual Range and regions floristically related. Price, \$4.00 per year, net, postpaid, in funds payable at par in United States currency in Boston; single copies (if available) of not more than 24 pages and with 1 plate, 40 cents, numbers of more than 24 pages or with more than 1 plate mostly at higher prices (see 3rd cover-page). Volumes 1-9 can be supplied at \$4.00, 10-34 at \$3.00, and volumes 35-46 at \$4.00. Some single numbers from these volumes can be supplied only at advanced prices (see 3rd cover-page). Somewhat reduced rates for complete sets can be obtained on application to Dr. Hill. Notes and short scientific papers, relating directly or indirectly to the plants of the northeastern states, will be considered for publication to the extent that the limited space of the journal permits. Forms may be closed five weeks in advance of publication. Authors (of more than two pages of print) will receive 15 copies of the issue in which their contributions appear, if they request them when returning proof. Extracted reprints, if ordered in advance, will be furnished at cost.

Address manuscripts and proofs to

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Subscriptions (making all remittances payable to RHODORA) to

Dr. A. F. Hill, 8 W. King St., Lancaster, Pa., or, preferably, Botanical Museum, Oxford St., Cambridge 38, Mass.

Entered as second-class matter March 9, 1929, at the post office at Lancaster, Pa., under the Act of March 3, 1879.

INTELLIGENCER PRINTING COMPANY

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VEGETATION OF ARTIFICIAL LAKES IN NORTHWESTERN ARKANSAS

J. B. MOYLE, E. L. NIELSEN AND O. R. YOUNGE¹

During recent years several artificial lakes or water reservoirs have been created in northwestern Arkansas. Aquatic and marsh vegetation has rapidly invaded these newly flooded areas which were formerly farm and forest land. In 1939, extensive collecting was done at four of these reservoirs to determine the nature and extent of natural revegetation. The reservoirs considered include Lake Wedington, near Fayetteville in Washington County; Lake Atalanta, near Rogers in Benton County; the reservoir at Cave Springs in Benton County and that in Devil's Den State Park, Washington County. Lake Wedington and Lake Atalanta each cover about 80 acres and have a maximum depth of about 40 feet. The reservoirs at Cave Springs and Devil's Den have areas of about 3 and 5 acres, respectively, and a depth of about 15 feet.

Two years after Lake Wedington began to fill, 39 species of aquatic and wet soil plants had established themselves. The commonest submerged species were *Chara Braunii* Gmel., *Najas guadalupensis* (Spreng.) Morong and *Potamogeton Berchtoldi* Fieber var. *tenuissimus* (Mert. & Koch) Fern. The most com-

¹ Aquatic Biologist, Bureau Fisheries Research, Minnesota Department of Conservation, St. Paul; Associate Agronomist, Division of Forage Crops and Diseases, U. S. Department of Agriculture, Soils and Agricultural Engineering, Madison, Wis. and Lancaster, Ky., respectively. The collections were made by Nielsen and Youngue and the specific determinations by Moyle. Specimens are deposited in the Herbarium of the University of Minnesota.

mon shoreline species was *Eleocharis obtusa* (Willd.) Schult. Other species collected include *Typha latifolia* L., *Potamogeton nodosus* Poir., *P. natans* L., *Alisma Plantago-aquatica* L., *Lophotocarpus calycinus* (Engelm.) J. G. Smith, *Sagittaria ambigua* J. G. Smith, *S. graminea* Michx., *S. latifolia* Willd., *S. rigida* Pursh, *Anacharis occidentalis* (Pursh) Victorin, *Eragrostis hypnoides* (Lam.) BSP., *Echinochloa pungens* (Poir.) Rydberg, *E. colonum* (L.) Link, *Leersia oryzoides* (L.) Swartz, *Carex gynandra* Schwein., *Cyperus acuminatus* Torr. & Hook., *C. esculentus* L., *C. ovalaris* (Michx.) Torr., *C. odoratus* L., *Commelina hirtella* Vahl, *Juncus diffusissimus* Buckley, *J. effusus* L., *J. interior* Wiegand, *J. nodatus* Coville, *Polygonum coccineum* Muhl., *P. Persicaria* L., *P. punctatum* Ell., *Ceratophyllum demersum* L., *Nelumbo pentapetala* Walt., *Ludwigia alternifolia* L., *Nymphoides peltatum* (Gmel.) Britten & Rendle, *Heliotropium indicum* L., *Lindernia anagallidea* (Michx.) Pennell, *Utricularia biflora* Lam. and *Bidens frondosa* L.

A year after the filling of Lake Atalanta the following six species of aquatic and shoreline plants were present: *Potamogeton foliosus* Raf. var. *genuinus* Fern., *Kyllinga pumila* Michx., *Cyperus esculentus* L., *C. strigosus* L., *Leersia oryzoides* (L.) Swartz and *Nasturtium officinale* R. Br. The Devil's Den reservoir, two years after filling, had a sparse flora of *Chara* sp. and *Juncus effusus* L. The exact age of the reservoir at Cave Springs, which is somewhat older, was not ascertained. Eight species were collected here. These included *Chara fragilis* Desvaux, *Typha latifolia* L., *Potamogeton foliosus* Raf. var. *genuinus* Fern., *Leersia oryzoides* (L.) Swartz, *Cyperus strigosus* L., *Scirpus palidus* (Britton) Fern., *Lycopus rubellus* Moench and *Mentha canadensis* L.

SENECIO TOMENTOSUS Michx., forma **alabamensis** (Britton) stat. nov. *S. alabamensis* Britton ex Small, Fl. Se. U. S. 1305 (1903).

Several collections from eastern Virginia, such as Grimes, no. 3552 from James City County, Heller, no. 850 from Isle of Wight County, and Fernald & Moore, nos. 15,162 and 15,163 from Nansemond County, show that *S. alabamensis* is at best an extreme glabrous or glabrescent form of the generally tomentose

S. tomentosus. Its stout caudex, coarse fistulous and soon very brittle and fractured stems, its leaf-outline and toothing, inflorescence, and hirtellous columnar achenes are inseparable from those of the much commoner typical *S. tomentosus*.—M. L. FERNALD.

THE GENUS *LIATRIS*

L. O. GAISER

(Continued from page 263)

With *L. ligulistylis* (Nels.) K. Sch. abundant in the prairie provinces and the states immediately adjacent (Wisconsin, Minnesota, North and South Dakota) and thence southwestward through Wyoming, Colorado and northern New Mexico, there are found in Michigan, Illinois, Indiana and Ohio, (a geographically central region for the series *Scariosae*), what may be intermediates between *L. ligulistylis* and another species. Lunell described *Laciniaria scariosa* var. *Nieuwlandii* as having stem not unusually 1 m. high, simple or even branched (then with few-headed branches), with a few-headed, short-pedicelled, narrow short inflorescence to ample many-headed, long-pedicelled or long-branched one with an ample green foliage . . . involucre bracts bright green over the whole surface or with narrow almost entire purple margins. Examination of the type showed a striking similarity in the nine large heads to a robust form of *L. ligulistylis* with herbaceous phyllaries. That modifications of the type are easily found was recognized by Lunell since he described 3 forms: f. *borealis* (renamed *septentrionalis* (Amer. Mid. Nat. ii. 264 (1912))), f. *versicolor* and f. *gracillima*. In the note regarding f. *borealis*, Lunell made this remark: the "short stem and short, few-headed raceme bespeak its northern origin". The type of forma *borealis* Nov. 13, 1911, *J. H. Nieuwland*, no. 1680, from 7 Mile Road, Detroit, Michigan (N. D.) has 10 heads, and a few buds, with erect, suborbicular, only slightly scarious-margined phyllaries, and again resembles *L. ligulistylis* in general habit, though the leaves are numerous and linear-lanceolate, suggesting possibly a blending with *L. borealis* of the New England States. Other specimens seen have given a similar suggestion, as *Dr. Crossman*, without locality, Michigan (G). However,

mostly the specimens, especially those from Michigan, have broadly lanceolate basal leaves and large few-headed inflorescences with erect phyllaries that at least associate them with *L. ligulistylis*. We regard them as a hybrid of *L. ligulistylis* and possibly *L. borealis*. Examination of the corolla-tubes of the type specimens of all three *formae* showed occasional hairs inside rather than the very definite non-pilose condition in *L. ligulistylis* and thus too gave evidence of hybridity.

In the two complete plants on the type sheet of Lunell's *Laciniaria scariosa* var. *praesignis* (of C. C. Deam, no. 9986, from stone bluffs of Pine Creek above Mudlavia, Warren Co., Ind. (M)) there seem to be clearly combined the leaf-characters and few heads in an almost strict spike of *L. ligulistylis* with erect phyllaries having finely ciliolate margins and though they appear to be somewhat depauperate specimens we place this variety here in synonymy. A third incomplete plant on the sheet with an inflorescence of more numerous (19) heads, having phyllaries that are pubescent on the surface could be an intermediate of *L. scabra* and *L. aspera* (see no. 19).

21. *LIATRIS BOREALIS* Nutt. ex MacNab. Stem glabrous or sparingly pubescent with appressed hairs, somewhat striate, 4-6 dm. high from a rounded corm up to 5 cm. in diameter: leaves numerous, often twisted, glabrous or with sparse distribution of hairs along the midrib beneath or on the lower surface and ciliate along the margin, the basal lanceolate, 1-1.5 dm. long and 1 cm. wide, merely narrowed to a clasping base, hardly petiolate; upper cauline leaves numerous, linear-lanceolate, sessile, gradually reduced in length to bracts 2-3 cm. long, subtending the flower-heads: inflorescence with rachis pubescent, 1-3 dm. long, of 5-30 short- or longer-pedicelled heads, of 35-60 flowers, broadly campanulate to hemispherical in form because of the loosely appressed but erect, non-recurved, rounded to oblong phyllaries; basal herbaceous outer phyllaries ovate to rounded, sometimes slightly pubescent like the pedicels, with ciliolate, rarely colored margins; middle and inner phyllaries rounded to linear, thinner, often marginally colored, though varying from narrowly to hardly at all petaloid, with a finely ciliolate margin (where the phyllaries are more petaloid the fine ciliolae practically disappear); corolla purple, rarely white, tube scantily pilose within, 9-10 mm. long; pappus ca. 8 mm. long; achene 6-7 mm. long.—*L. borealis* Nutt. ex MacNab, Edinb. New Phil. Jour. xix. 60 (1835). *L. scariosa* β *intermedia* Ell. Sk. ii. 281 (1824). *L. scariosa* of Edwards, Bot. Reg. t. 590 (1821) and Lindley, Bot.

Reg. t. 156 (1835), not (L.) Willd. *Liatris squarrosa* sensu Sweet, Br. Fl. Gard. t. 44 (1824), not (L.) Willd. *Lacinaria scariosa* var. *novae-angliae* Lunell, Amer. Mid. Nat. ii. 172, 177 (1912). *Liatris novae-angliae* (Lunell) Shinnars, Amer. Mid. Nat. xxix. 29 (1943). *L. novae-angliae* f. *albiflora* Shinnars, Amer. Mid. Nat. xxix. 29 (1943).

Southwestern Maine to Pennsylvania.—MAINE. Without stated locality, Aug. 21, 1927, *E. E. Perkins* (US). YORK Co.: North Berwick, Sept. 5, 1891, *J. C. Parlin* (G). NEW HAMPSHIRE. Without stated locality, Aug.—Sept., *Little* (P). MASSACHUSETTS. ESSEX Co.: Ipswich, *Oakes* (G, NY, P); in the fields, Ipswich, 1816, *Dr. Boott*, 1353 (US); Salem, *Nuttall* (P, type); roadside, Boxford, Sept. 2, 1887, *G. G. Kennedy* (G, P); Boxford, Aug. 1893, *F. H. Peabody* (G); Boxford (albino), Sept. 10, 1909, *A. L. Page* (G). MIDDLESEX Co.: Tewksbury, Sept. 24, 1899, *E. F. Williams*, 2 (G); Westford, *E. F. Fletcher* (G); Concord, Aug. 30, 1888, *C. E. Faxon* (G); old graveyard, Malden, *C. E. Faxon* (G). WORCESTER Co.: border of Wachusett Reservoir, Boylston, 1930, *E. W. Bemis* (G); Rutland, Sept. 6, 1926, *R. H. Piper*, 283 (O). FRANKLIN Co.: New Salem, Aug. 21, 1929, *A. S. Goodale*, *W. Markert* & *R. H. Piper*, 55731 (G). NORFOLK Co.: Dedham, Islington Junction, Aug. 22, 1897, *E. F. Williams*, 1 (G). HAMPSHIRE Co.: Prescott, Aug. 26, 1929, *R. H. Piper*, 517 (O). HAMPDEN Co.: sparsely wooded, sandy plain, Southwick, Sept. 14, 1914, *F. C. Seymour*, 279 (NY). BARNSTABLE Co.: dry, sandy field, s. of Blueberry Pond, Brewster, Sept. 12, 1927, *M. L. Fernald*, 490 (G, NY, P, O); dry soil, near mouth of Red River, Harwich, Aug. 25, 1918, *M. L. Fernald* & *B. Long*, 17455 (G, P); dry argillaceous fields, n. of No Bottom Pond, Brewster, Sept. 7, 1918, *M. L. Fernald* & *B. Long*, 17456 (G, NY, P); Chatham, *M. L. Fernald* & *B. Long*, 19175, 10505 (P); Quissett Harbour, Sept. 6, 1923, *M. L. Fernald*, *B. Long* & *J. M. Fogg* (P), Sept. 20, 1918, *M. L. Fernald* & *C. A. Weatherby*, 17457 (G); Oyster Pond, Falmouth, *F. W. Pennell*, 3497 (P); s. w. of Barnstable, Sept. 16–17, 1916, *R. C. Bean*, *F. W. Bird* & *C. H. Knowlton* (P); North Falmouth, *F. W. Pennell*, *L. A. Kenoyer*, 3466 (P); dry soil, W. Falmouth, Aug. 27, 1906, *J. A. Cushman* (Q); Hyannis Point, Sept. 5, 1898, *J. M. Greenman*, 441 (G). PLYMOUTH Co.: sandy woods and thickets, near Rickard's Pond, Carver, Aug. 30, 1913, *M. L. Fernald*, *F. W. Hunnewell* & *B. Long*, 10503 (G, P); Plymouth, Sept. 17, 1889, *J. H. Redfied* (P), *Mr. Gilbert* (G); Marion, Sept. 1888, *Miss A. M. Vail* (NY); Brockton, Sept. 27, 1901, *C. B. Blomberg* (US). NANTUCKET Co.: Wauwinet, Sept. 8, 1894, *E. F. Williams* (P); moorland, *F. W. Pennell*, 11002 (P); dry roadside, Sept. 4, 1913, *Miss E. M. Moody* (G); roadsides, Aug. 30, 1897, *Miss F. N. Vasey* (US); without stated locality, Sept. 14, 1899, *E. P. Bicknell*

(NY). DUKE Co.: Chappaquiddick Isl., Aug. 1898, A. Hollick (G, NY). RHODE ISLAND. PROVIDENCE Co.: Cumberland (Manville), 1880, G. Hunt & W. W. Bailey, 175 (US); Warwick Twsp., Sept. 5, 1875, *Amer. Mus. Nat. Hist.* (NY). KENT Co.: Johnston Twsp., Aug. 8, 1878, G. C. Capron (NY); Coventry, Aug. 1895, J. F. Smith (US). NEWPORT Co.: dry hillside, near New Shoreham Center, Block Isl., Sept. 15, 1913, M. L. Fernald, B. Long & G. S. Torrey, 10506 (G, NY, P); Block Isl., 1916, Gravatt (US). CONNECTICUT. WINDHAM Co.: dry gravelly soil, Putnam, Sept. 5, 1908, C. H. Bissell & C. A. Weatherby (G). NEW LONDON Co.: sandy soil, s. of Westchester Sta., Colchester, Sept. 23, 1904, C. B. Graves (G). NEW HAVEN Co.: dry soil, near coast, Guilford, Sept. 16, 1906, G. H. Bartlett (G); Stratford, Sept. 9, 1895, E. H. Eames (G); Stratford (albino), Oct. 5, 1927, E. H. Eames, 10402 (G); New Haven, Sept., 1874, A. H. Young, 23 (ND, type of *Laciniaria scariosa* var. *novae-angliae* Lunell); in sandy waste, near New Haven, Nov. 9, 1879, J. A. Allen (P). FAIRFIELD Co.: Fairfield, Sept. 9, 1893, E. H. Eames (US). NEW JERSEY. MONMOUTH Co.: Middletown, Sept. 1838, Torr. & Gray (G). NEW YORK. Co. undetermined: Long Isl., J. Torrey (P). ALBANY Co.: sandy soil, near Londonville, Sept. 15, 1932, H. D. House, 20173 (G, NY). QUEENS Co.: Old Mill Yacht Club (albino), Sept. 8, 1940, H. N. Moldenke, 11606 (NY). NEW YORK Co.: Harlem River, Sept. 23, 1865, W. H. Leggett (NY). SUFFOLK Co.: Greenport, Sept. 1870, W. G. Farlow (G); Aquebogue, Sept. 1873, H. M. Young (US); in wet pockets, among sand dunes, Easthampton, Long Isl., Aug. 18, 1938, W. C. Muenscher & O. F. Curtis, 6603 (G, NY); sandy pine woods, East Islip, Aug. 31, 1938, W. C. Muenscher & O. F. Curtis, 6602 (US); near MacKay Radio Sta., Aug. 18, 1938, W. C. Muenscher & O. F. Curtis, 6603 (G), 6602 (P). NASSAU Co.: near Flushing, Sept. 17, 1936, J. Monachino, 175 (O); Locust Grove, Sept. 3, 1936, S. A. Cain (NY). PENNSYLVANIA. CENTRE Co.: dry, rocky, grassy bank in Half Moon Valley, 2 mis. n. of State College, Aug. 18, 1938, H. A. Wahl, 226 (G).

MacNab (Edin. New Phil. Jour. xix. 60 (1835)) in publishing *Liatrix borealis* stated: "While looking through the herbarium of Nuttall when at Philadelphia, I found that the species was marked *L. borealis* but no description of it has yet been published".

Presumably the type specimen is at the British Museum in London where Nuttall's Herbarium is, but Mr. Weatherby did not find it when obtaining photographs of others of Nuttall's types in the summer of 1939. There is a specimen in the Her-

barium of the Philadelphia Academy of Sciences from Salem, Mass., named *Liatris borealis* in Nuttall's handwriting. The name *borealis* has been crossed out, but Dr. Pennell¹ stated: "the width of the line made, makes me think it was not Nuttall himself". This specimen may then be the type.

The plant in Philadelphia, though incomplete, shows there had been 7 heads on pedicels about equal in length to the one remaining head, 2 cm. long, with generally erect phyllaries. The outer ones are hardly at all scarious, finely ciliate; the inner linear-oblong ones becoming a little more scarious but still having a fine ciliate margin. The few remaining cauline leaves are narrowly linear and sessile having a few hairs scattered over the surface.

From MacNab's description, *Liatris borealis* had a simple pubescent stem; ovate-lanceolate, acuminate, long-petiolate radical leaves; stem-leaves sessile, narrowed toward both ends and rough on the margins; outer phyllaries obovate with colored margins; inner ones linear, equal in length to the heads; heads on rather long pedicels, remote, alternating in two rows. "Habitat: dry woods and rocky places throughout the Alleghany mountains". Having omitted mention of the character of the phyllaries in this description, he however adds the note: "This species is readily distinguished from *L. scariosa* (which by some is supposed to be only a variety), by its being very much smoother, having fewer leaves and flowers and reflected bracteas; also by its short styles which scarcely exceed the corolla, whereas in *L. scariosa* the styles are long and the leaves, flowers and bracts are all upright". The phyllaries ("bracteas") of Nuttall's plant from Salem are clearly not reflexed, whereas those of *Liatris scariosa*, as seen in the Linnaean type (see no. 17), certainly are. Paxton, (Paxt. Mag. v. t. 27 (1838)) so briefly described *Liatris borealis*, accompanied by a plate, from a plant cultivated in a nursery at Epsom, Scotland, received in 1836 from the Glasgow Botanical Garden, where it was presumed to have been introduced by Mr. Drummond, that it is not determinative. Torr. & Gray (Fl. N. Am. ii. 75 (1841)) referred *Liatris borealis* of Paxton to *L. scariosa*, and Gray (Synop. Fl. 1², 110 (1884)) did the same. I do not find any reference in either work to *L. borealis* MacNab. That

¹ By private communication.

Paxton's plant was identical with Nuttall's is doubtful. His description and accompanying plate seem to be nearer *L. scariosa* var. *typica*, but in any case MacNab's description is earlier and hence must have precedence. Whether MacNab wrote his description from brief notes made on Nuttall's plant or whether there was another plant is not known, but the essential character which he emphasizes in his discussion of *L. borealis*, that differs from the plant we have seen in the Philadelphia Academy, labelled in Nuttall's handwriting, is the reflexed rather than erect phyllaries. The description above embodies the writer's ideas of *Liatris borealis* Nutt. Examination of the type specimen of *Laciniaria scariosa* var. *novae-angliae* Lunell (Amer. Mid. Nat. ii. 172, 177 (1912)) showed it to be the same species as Nuttall's plant from Salem, Mass.

22. *LIATRIS EARLEI* (Greene) K. Sch. Corm small, subglobose, ca. 2 cm. in diameter: stem usually single, 4-9 dm. high, often somewhat virgate, softly and densely pubescent, or asperous with short white hairs, or even almost glabrous: leaves glabrous, softly pubescent and rough on the margins only, or more rarely scabrous, the basal sharply lanceolate, 10-20 cm. long, 5-15 cm. wide, subpetiolate, narrowing to a short- or longer-winged petiole from one third to one half the length of the blade, the upper rigid, sharp-pointed, narrowly lanceolate or linear, reduced from 6-8 cm. long to narrow bracts less than 1 cm. subtending the heads: inflorescence narrowly racemose, of 20-50 subsessile heads on erect or depressed pedicels about as long as the heads, or more rarely becoming branched and paniculate by the elongation of the pedicels into slender peduncles bearing several heads each; heads of 15-25 flowers, somewhat turbinate or campanulate, 1-1.5 cm. long and ca. 1 cm. wide when flowers are open: phyllaries appressed or sometimes recurved, herbaceous, green and softly pubescent, with ciliolate but almost non-scarious margins; outer phyllaries subovate; middle and inner ones oblong-spatulate, 7-8 mm. long and 2-3 mm. wide, herbaceous and usually finely pubescent, sometimes with purplish ciliolate margin; corolla-tube 7-9 mm. long, scantily to moderately pilose at the base of the tube: mature achene 3-4 mm. long; pappus about 6 mm. long, barbellate.—Just, Bot. Jahresb. xxix¹. 569 (1903). *Laciniaria Earlei* Greene, Pittonia, iv. 316 (1901). *Laciniaria Tracyi* Alex. ex Small, Man. S. E. Fl. 1335 (1933). *Laciniaria Ruthii* Alex. l. c., not *Laciniaria Ruthii* Bush, Amer. Midl. Nat. xii. 316 (1931). *Liatris squarrulosa* sensu Shinnars, Amer. Midl. Nat. xxix. 33 (1943), not Michx.

Occasional from North Carolina to Florida, abundant from

Tennessee to Alabama, and again occasional westward to Indiana, Louisiana and Texas.—NORTH CAROLINA. Co. undetermined: s. slopes of Joanna Bald, Sept. 20, 1900, 22 (NY). HAYWOOD Co.: Waynesville, 1897, *T. G. Harbison* (G). CHEROKEE Co.: 3-4 mis. e. of Andrews, Sept. 20, 1900, 21 (NY). SOUTH CAROLINA. BEAUFORT Co.: sandy soil, Sept. 6, 1904, *Biltmore Herb.*, 2670k (US). GEORGIA. RICHMOND Co.: oakwoods, Augusta, Sept. 25, Oct. 10, 1898, *A. Cuthbert* (NY). FLORIDA. Without stated locality: in rich soil, *Chapman* (G). INDIANA. HARRISON Co.: s. slope of Elisabeth Hill, 3 mis. e. of Elisabeth, Oct. 13, 1916, *C. C. Deam*, 22429 (US). KENTUCKY. LOGAN Co.: rocky hill near Russellville, Sept. 17, 1903, *Biltmore Herb.*, 2670h (US). TENNESSEE. Co. undetermined: Hiwassee Valley, Oct. 1896, *A. Ruth*, 34 (NY, type of *Laciniaria Ruthii* Alex.); sandy ground, Hiwassee Valley, Oct. 1896, *A. Ruth* (US); mts., E. Tennessee, Smoky Range, Sept. 1897, *A. Ruth*, 3767 (NY); dry soil, White Cliff Springs, E. Tennessee, Aug. 1879, *G. Andrews* (US); sandy soil, Higdon, E. Tennessee, Oct. 1895, *A. Ruth* (US). KNOX Co.: thickets, Knoxville, June 1897 (no. 3766), Aug. 1896 (no. 36), *A. Ruth* (NY); copses, Knoxville, June 1898, *A. Ruth*, 657 (US); open woods, Knoxville, July 1891, *A. Ruth* (US, 694398); dry woods, 5 mis. from Knoxville, Oct. 5, 1897, *A. Ruth*, 205 (US). COCKE Co.: dry rock banks, Wolf Creek, Sept. 24, 1897, *Biltmore Herb.*, 2670a (G, US). BLOUNT Co.: mountainsides, July 8, 1898, *A. Ruth* 674 (NY). MONROE Co.: 10 mis. n. w. of Tapoco, Sept. 21, 1933, *E. J. Alexander, T. H. Everett & S. D. Pearson* (NY); Tapoco, Sept. 21, 1933, *E. J. Alexander, T. H. Everett & S. D. Pearson* (NY). GRUNDY Co.: near Monteagle, Sept. 23, 1933, *E. J. Alexander, T. H. Everett & S. D. Pearson* (NY). POLK Co.: near Archville, Sept. 25, 1933, *E. J. Alexander, T. H. Everett & S. D. Pearson* (NY). HAMILTON Co.: Lookout Mt., 1878, *G. R. Vasey* (US, 63440). ALABAMA. MADISON Co.: on Monte Sano, near Huntsville, Autumn, 1937, *Mrs. N. G. Stevens* (NY). CULLMAN Co.: without stated locality, Oct. 5, 1901, *Biltmore Herb.*, 2670m (US). TALLADEGA Co.: slopes of Lookout Mt., near Childersburg, Oct. 2, 1899, *Biltmore Herb.*, 9537 (US). JEFFERSON Co.: dry hills, Avondale, Oct. 9, 1900, *Biltmore Herb.*, 3402 (G, US). TUSCALOOSA Co.: dry hills, Tuscaloosa, Oct. 4, 1898, *W. M. Canby*, 67 (G). GREENE Co.: chalk prairie, 2 mis. n. w. of Greene, Nov. 5, 1933, *R. M. Harper*, 3137 (G, NY, US). LEE Co.: Auburn, Sept. 27, 1896, *F. S. Earle* (ND, type). BALDWIN Co.: Gateswood, Oct. 31, 1903, *S. M. Tracy*, 8558 (G (NY, type of *Laciniaria Tracyi* Alex.) US, ND). MOBILE Co.: Mobile, Sept. 24, 1912, *H. H. Bartlett*, 3217 (G, US); mixed woods, s. of Mobile, Sept. 24, 1912; *H. H. Bartlett*, 3223 (US); dry woods, Mobile, Oct. 14, 1898, *C. Mohr* (US);

Mobile, Aug. *C. Mohr* (US); dry pine woods, Mobile, Oct. 20, 1896, *Herb. Geol. Surv. Ala.* (US); pine woods, n. e. of Whistler, Oct. 1919, *E. W. Graves*, 1370 (US); barrens, w. of Spring Hill, Oct. 1918, *E. W. Graves*, 587 (US); sandy scrubby pineland, Hollander's Isl., Sept. 3, 1912, *F. W. Pennell*, 4505 (US). MISSISSIPPI. ATTALA Co.: Ethel, *W. W. McBride* (US). LAUDERDALE Co.: Meridian, Oct. 10, 1896, *C. Schuchert* (US). JACKSON Co.: Ocean Springs, Oct. 17, 1898, *S. M. Tracy* 4871 (US). HARRISON Co.: Biloxi, Aug. 23, 1898, *S. M. Tracy*, 4334 (NY); grassy barrens, near Mississippi City, Sept. 14, 1885, *J. D. Smith*, 425 (US). LOUISIANA. CALCASIEU Co.: Jacksonville, *T. Drummond*, 66 (G). TEXAS. Without stated locality: *C. Wright* (G). HARRIS Co.: Houston, Sept. 24, 1937, *G. L. Fisher* (US).

Since *L. squarrulosa* came to be recognized as a variety of *L. scariosa* with small heads, all such specimens were watched for and carefully compared. Though we have found a near match for Michaux's type in H. W. Ravenel's specimens from Santee Canal, S. C. (G), and those of H. H. Bartlett, no. 2420, from pine barrens near Thomson, McDuffie Co., Ga. (G, US), they are nevertheless comparatively rare in herbarium collections.

Greene (Pittonia, iv. 316 (1901)) described a plant collected Sept. 27, 1896, by *F. S. Earle*, at Auburn, Lee Co., Ala. (ND), as *Laciniaria Earlei*, with a racemose inflorescence of small campanulate heads on a tall, somewhat virgate stem, having appressed, non-scarious, purple, ciliolate-margined phyllaries, and narrowly lanceolate and linear leaves "glabrous . . . except for a few bristly marginal hairs at bases of some leaves". *Laciniaria Tracyi* Alex. (Man. S. E. Fl. 1335 (1933)) was also described from an Alabama plant (Oct. 31, 1903, *S. M. Tracy*, no. 8558, from Gateswood, Baldwin Co. (NY)) as having somewhat rounded, spatulate, pubescent phyllaries and linear, very scabrous lower leaves. Examination of the two type specimens showed no further marked differences in heads, flowers or leaf-shape and, as in other species of the genus there occurs the entire range from glabrous to scabrous leaves. it seemed these two were very similar, especially, since in a specimen like *E. W. Graves*, no. 587, from the barrens w. of Spring Hill, Mobile Co., Ala. Oct., 1918 (US), there is to be seen a very close parallel to Tracy's plant with, in addition, two very basal leaves that are long and lanceolate. The description of *L. Ruthii* Alex. for a plant collected

Oct. 1896, A. Ruth, no. 34, from the Hiwassee Valley, E. Tennessee (NY), with glabrous linear-lanceolate leaves and slightly larger heads, would seem to suggest a plant slightly more robust, but with heads having similarly somewhat spatulate, pubescent (though longer) phyllaries and glabrous rather than scabrous leaves. Examination of the types and comparison of a number of specimens, having smaller heads, from North Carolina to Florida and from Tennessee to Mississippi show that it is an easy step from Michaux's South Carolina plant (the type of *L. squarrosa*) to the Alabama plants of Earle and Tracy and another easy step to the glabrous one of Ruth from Tennessee. All have 15-25-flowered heads with the narrower herbaceous phyllaries and, though Michaux described those of his plant as squarrose and in the others they were stated to be erect, it is found that they are sometimes squarrose in heads of the narrow-leaved plants from Alabama. Thus, though it is difficult to draw sharp lines, the prevalence of linear or sharply pointed, narrowly lanceolate-linear, upper cauline leaves with lanceolate lower ones in the type plants of Earle, Tracy and Ruth, represents the trend in these smaller-headed relatives of *L. scariosa* from the region around the Gulf of Mexico in Alabama and Mississippi and northward. Specimens from the middle and northern counties of Alabama, as Talladega, Jefferson and Cullman, foretell by their lanceolate basal leaves the material from Tennessee. Since none of these specimens have the broadly obovate basal and narrower but still oblanceolate upper leaves of Michaux's plants of *L. squarrosa* we are including them under *Liatris Earlei*.

As in all species of this series, plants of intermediate characters between two species of the same geographic range can be recognized. In Tennessee, from which the lanceolate-leaved specimen of Ruth came, other specimens show, in combination with broadly lanceolate basal leaves quite scarious-margined and slightly crisped elongate phyllaries, thus suggesting a blending with *L. aspera* var. *intermedia*. Biltmore Herb., no. 2670, from dry soil, Lookout Mt., Hamilton Co., Aug. 24, 1897 (US, 332418) is such a specimen while another sheet, also Biltmore Herb., 2670 (US, 957890) of the same date and locality, is clearly *L. aspera* var. *intermedia*. Similar to the above intermediate are Biltmore

Herb. No. 2670b, from dry soil, near Hendersonville, Henderson Co., N. C., Sept. 14, 1898 (US) and Biltmore Herb. No. 2670l, from Chickamauga Park, Ga., Sept. 21, 1899 (US). So also collections from Illinois of Sept. 13, 14, and 23, 1914, *R. Ridgway*, nos. 90, 88, and 87 respectively, from Calhoun prairie, from near Olney and from Sugar Creek prairie, seem to present intermediates between the very asperous form of *L. Earlei* and *L. scabra*.

SERIES VII. ELEGANTES. Distinctive species with plume-like inflorescence due to long heads (2.5–3 cm. long) in loose spicate to paniculate arrangement with prolonged, colorful, scarious, reflexed phyllaries; corolla as frequently white as purple. nonpilose within; achene 4–6 mm. long; pappus 9–11 mm. long and manifestly plumose.

From South Carolina and Florida and westward into Texas and south-west Arkansas.

23. *LIATRIS ELEGANS* (Walt.) Michx. Rootstock commonly relatively small, globose, 1–3 cm. in diameter, though in one variety elongate, tapering, up to 3 cm. in diameter and 15 cm. long; stems one or two, 3–12 dm. high, finely pubescent and leafy: leaves sessile, glabrous, punctate, linear to linear-lanceolate, reduced upwards from basal ones not more than 10 cm. long and 5 mm. wide to bracts subtending the long heads; upper leaves commonly soon deflexed; inflorescence 3–5 dm. high, cylindrical to pyramidal according to amount of elongation basally of usually short pedicels of subsessile heads into longer sub-branched peduncles; heads usually 5-flowered, 2.5–3 cm. long; outer phyllaries short, lanceolate, herbaceous: inner ones prolonged into dilated, lanceolate and reflexed or truncate and rounded, petaloid, serrulate tips, phlox-pink or white and surpassing the flowers and pappus; corolla 9–11 mm. long, as frequently white as purple, or of intermediate mauve shades (yellow in the singular f. *Fisheri*), nonpilose within; stamens usually purple even within the white flowers, though sometimes white also; achene 4–6 mm. long; pappus long-plumose, 9–11 mm. long.—Fl. Bor.-Amer. ii. 91 (1803); Willd. Sp. Pl. iii. 1635 (1803)¹. *Stachelina elegans* Walt. Fl. Car. 202 (1788). *Serratula speciosa* Ait. Hort. Kew. iii. 138 (1789). *Eupatorium speciosum* Vent. Hort. Cels. 79 (1802). *Liatris radians* Bertol. Misc. v. 9. t. 1 (1846).

¹ See Schubert in RHODORA xliv. 147–150 (1942) for comparative dates of publication.

KEY TO VARIETIES

- a. Inner phyllaries dilated into lanceolate, reflexed serrulate petaloid tips....b.
- b. Rootstock small, rounded; common over the range of the species.....var. *typica*.
- b. Rootstock elongate, tapering; found only in the Carizzo sand of Texas.....var. *carizzana*.
- a. Inner phyllaries dilated into truncate, rounded, irregularly serrate, scarious tips; found only on St. Helena Isl., South Carolina.....var. *flabellata*.

Var. *typica*. Rootstock small, globose, as found commonly over the range of the species: inner phyllaries with lanceolate-acuminate, dilated, petaloid apices showing the midrib extended at the tip, ca. 2 cm. long; corolla-tube 9–11 mm. long; achene 4–5 mm. long; pappus 8–11 mm. long.—*Liatris elegans* (Walt.) Michx. Fl. Bor. Amer. ii. 91 (1803) sens. strict.; Willd. Sp. Pl. iii. 1635 (1803); Edwards Bot. Reg. t. 267 (1818); DC. Prodr. v. 129 (1836); Torr. & Gray Fl. N. Am. ii. 68 (1841); Gray Synop. Fl. i². 109 (1884). *Laciniaria elegans* O. Ktze. Rev. Gen. i. 349 (1891); Small, Man. S. E. Fl. 1332, with fig. (1933).

From South Carolina, south to Florida and west through Alabama, Louisiana, into Texas and again northward into south-west Arkansas.—**SOUTH CAROLINA.** Without stated locality: *Chapman* (G). Co. undetermined: low country of South Carolina, *L. R. Gibbs* (NY). **GEORGETOWN Co.:** pine barrens, 5 mis. s. of Georgetown, Sept. 9, 1939, *R. K. Godfrey*, 8135 (G, NY). **BEAUFORT Co.:** Beaufort District, 1882 (no. 377), 1888, *Dr. J. H. Mellichamp* (US); Bluffton, *Dr. J. H. Mellichamp* (NY); in woods, St. Helena Isl., Sept., *A. Cuthbert* (NY); dry woods, St. Helena Isl., Sept. 1883, *A. Cuthbert* (F); dry barrens, St. Helena Isl., Sept. 1884, Sept. 1894, *A. Cuthbert* (F); dry woods, St. Helena Isl., Sept. 1900, *A. Cuthbert* (NY, US); St. Helena Isl., Sept. 1900, *A. Cuthbert* (US); dry open woods, St. Helena Isl., Sept. 1894, *A. Cuthbert* (US); Sept. 21, 1902, Oct. 12, 1902, *A. Cuthbert* (F). **GEORGIA.** Without stated locality: 1839, *Dr. Torrey* (G, NY); *Dr. Boykin* (NY). Co. undetermined: along Flint River, *Ex. Herb. Chapman* (US). **RICHMOND Co.:** barrens, Augusta, Sept. 1896, *A. Cuthbert* (NY). **BIBB Co.:** sandy ridges, 5 mis. e. of Macon, Sept. 4, 1883, *J. D. Smith*, 2004 (US). **TAYLOR Co.:** dry sand hills, Anthony's Mill, 4 mis. w. of Reynolds, Sept. 14, 1936, *J. H. Pyron & R. McVaugh*, 1300 (US). **CHATTAHOOCHEE Co.:** dry soil, near Columbus, Sept. 17, 1902, *ex Biltmore Herb.*, 2668h (NY); sandy banks, 4 mis. e. of Columbus, Sept. 7, 1883, *J. D. Smith*, 1981 (US); Chattahoochee, Aug. 23, 1897, *S. M. Tracy* 3423 (NY). **SUMTER Co.:** dry sandy soil, south of Americus, Aug. 29, 1900, *R. M. Harper*, 532 (G, NY, US). **CHARLTON Co.:** St. Mary's River Swamp, below Trader's Hill, July 24–26, 1895, *J. K. Small* (NY). **FLORIDA.** Without

stated locality: 1842-49, *F. Rugel*, 471 (US). Co. UNDETERMINED: southern Florida, *ex Chapman Herb.* (NY); in dry, gravelly oakwoods, *ex Chapman Herb.* (G). DUVAL Co.: dry pine barrens, Jacksonville, Oct. 22, 1894, *A. H. Curtiss*, 5309 (G, NY, US); vicinity of Jacksonville, *A. H. Curtiss*, 1877 (ND); near Jacksonville, Oct. 21, 1893, *A. H. Curtiss*, 4445 (US); dry pine barrens, near Jacksonville, Oct. 1888, *A. H. Curtiss*, 1170 (G, NY, US, ND); St. Nicholas, July 28, 1896, *L. H. Lighthipe*, 335 (NY). COLUMBIA Co.: in high pine-turkey-oak woods n. of Camp Oleno, Oct. 6, 1940, *W. A. Murrill* (F). HAMILTON Co.: banks of Suwannee R., White Springs, Sept. 30, 1941, *E. West & Miss L. Arnold* (F). GADSDEN Co.: Quincy, Sept. 4, 1895, *G. V. Nash*, 2570 (G, NY, US, ND, F); Tallahassee, *N. K. Berg* (NY); open pinelands, western part of county, Aug. 30, 1936, *H. Foster*, 116 (F). WAKULLA Co.: without locality, Nov. 1891, *W. G. Farlow* (G). JACKSON Co.: Sneads, Aug. 19, 1942, *R. A. Knight* (F). WASHINGTON Co.: s. of Chipley, Aug. 23, 1942, *M. Senner* (F). OKALOOSA Co.: Crestview, Oct. 21, 1936, *Miss M. Hodges* (F). SAINT JOHNS Co.: dry pine barrens, St. Augustine, Oct. 1875, *Miss M. C. Reynolds* (NY, US, ND); pine barrens, Oct. *Miss M. C. Reynolds*, 306 (US). ALACHUA Co.: roadside, Hawthorne Rd., Oct. 31, 1931, *Miss L. Arnold* (F). TAYLOR Co.: high pine-oak woods, 9 mis. s. of Perry, Oct. 8, 1940, *W. A. Murrill* (F). MARION Co.: Citra, Nov. 10, 1941, *R. A. Knight* (F); high pineland, Belleview, Sept. 15, 1927, *O. F. Burger & E. West* (F). CITRUS Co.: sandy dry oak-pine woods, on U. S. Hwy. 41, 2 mis. s. of Holder, Oct. 16, 1945, *H. H. Hume* (F). PASCO Co.: dry woods, Lacoochee, Sept. 15, 1927, *O. F. Burger & E. West* (F). HILLSBOROUGH Co.: Tampa Bay, *G. Thurber* (G). ALABAMA. Without stated locality: *Mr. Lea* (G); 1840, *ex Herb. Meisner* (NY); *Gates* (G, NY, B, isotypes of *L. radians* Bertol.); Oct. 1820, *S. B. Buckley* (G). Co. undetermined: pine woods, Sept., *S. B. Buckley* (NY, US). LEE Co.: open pine woods, 6 mis. s. of Auburn, Sept. 23, 1899, *F. S. Earle & E. S. Earle*, 94 (G, NY, US, ND); Auburn, Sept. 11, 1898, *F. S. Earle & C. F. Baker* (NY, US), *C. F. Baker* (NY), Sept. 9, 1897, *F. S. Earle & C. F. Baker*, 1341 (NY), Sept. 1900, *F. E. Lloyd & F. S. Earle* (NY). AUTAUGA Co.: sandy old field, between Autaugaville and Booth, Sept. 24, 1934, *R. M. Harper*, 3264 (G, NY, US). BARBOUR Co.: sandy roadside, between Cottonton & Eufaula, Aug. 12, 1927, *K. M. Wiegand & W. E. Manning*, 3172 (G); around Eufaula, Aug. 1888, *G. McCarthy* (US). ESCAMBIA Co.: in high pineland, Canoe, Oct. 25, 1932, *F. S. Blanton*, 7071 (US); in low pineland, Atmore, Aug. 3, 1933, *O. Blanton*, 152 (G); in high hammock, 3 mis. n. of Canoe, Oct. 17, 1929, *H. O'Neill*, 6171 (US, F). BALDWIN Co.: Gateswood, Oct. 30, 1903, *S. M. Tracy*, 8568 (G, NY, US, T). Mo-

BILE Co.: dry exposed banks, Mobile, Oct. 16, 1896, *C. Mohr* (US); dry pine woods, Mobile, Sept. 28, 1878 (US); Mobile, Oct., *C. Mohr* (US); Mobile, 1868, *C. Mohr* (US); dry close soil, copses and thickets, Mobile, Oct. 16, 1886, *C. Mohr* (US); dry pine barrens, Mobile, Sept. 1, 1862, *C. Mohr* (Q); pine barrens, w. of Spring Hill, Aug. 1918, *E. W. Graves*, 691 (US). ARKANSAS. Without stated locality: *Drummond*, 141 (G); *Leavenworth* (NY). GARLAND Co.: dry woods, Glenwood Rd., 8 mis. from Hot Springs, Aug. 11, 1935, *F. J. Scully*, 434 (G); open field, Glenwood Rd., 8 mis. from Hot Springs, Aug. 8, 1935, *F. J. Scully*, 499 (G); Hot Springs, Aug. 1879, *G. W. Letterman* (US). HOT SPRINGS Co.: dry sandy ground, Malvern, Sept. 4, 1915, *E. J. Palmer*, 8453 (US). PIKE Co.: dry, rocky, oak-hickory woods, between New Hope & Langley, Oct. 5, 1932, *D. Demaree*, 9501 (G, NY). CLARK Co.: Gurdon, *C. Mohr* (US). BRADLEY Co.: rich open wood, Jersey, Sept. 18, 1938, *D. Demaree*, 18325 (O). HEMPSTEAD Co.: banks of Yellow Creek, near McNab, Oct. 5, 1923, *J. M. Greenman*, 4427 (G); sandy pine woods, Fulton, Oct. 15, 1914, *E. J. Palmer*, 6844 (US). MILLER Co.: near Texarkana, Aug. 20, 1898, *A. A. Heller & E. G. Heller*, 4124 (G, NY, US). LOUISIANA. Without stated locality: *ex. Torrey Herb.*, *C. W. Short* (NY). Co. undetermined: Red River, no collector, no date (G). NATCHITOCHES Co.: sandy open woods, Natchitoches, Sept. 30, 1915, *E. J. Palmer*, 8753 (US). RAPIDES Co.: Levins, Alexandria, Nov. 8, 1893, *C. Mohr* (NY); Alexandria, 1842, *Hale* ((G, without stated locality), NY, US); Glenmora, Sept. 30, 1913, *F. W. Pennell*, 5634 (NY); open dry hillside, n. edge of Pineville, July 30, 1938, *D. S. Correll & H. B. Correll*, 9931 (G, NY). TEXAS. Without stated locality: Sept. 1850, *G. Thurber* (G); *Wright* (G). 1843, *Lindheimer*, 71 (G). Co. undetermined: Shawnee villages, Canadian R.,¹ Aug. 1853, *Lieut. A. W. Whipple Exped.*, *J. M. Bigelow*, 1853-4, (NY, US); between Indianola & San Antonio, Oct. 9, 1891, *A. Schott* (NY); without stated locality: Mexican boundary survey of Major Emory, *C. C. Parry, J. M. Bigelow, C. Wright & A. Schott*, 451 (NY). BOWIE Co.: sandy soil, near Texarkana, Oct. 7, 1903, *ex Biltmore Herb.* 2668k (NY); Texarkana, *G. Letterman*, Oct. 15, 1894 (NY, US), Oct. 19, 1894 (US), Sept. 27, 1927, *B. C. Tharp* (G); oak-hickory w. of Texarkana, Sept. 27, 1927, *B. C. Tharp*, 2519b (G); Texarkana, 1896, *E. N. Plank* (NY), Sept. 21, 1877, *L. F. Ward* (US); dry open woods, Texarkana, Oct. 27, 1925, *E. J. Palmer*, 29412 (G). RED RIVER Co.: sandy loam, near Detroit, Sept. 15, 1937, *E. Adams*, 35 (US). GRAYSON Co.: Denison, Sept. 12, 13, 1906, *F. L. Tyler* (US). CASS Co.: Gallo-

¹ According to Bigelow, Report on Lieut. Whipple's Expedition, p. 96, Sec. 4. *L. elegans* was collected on this trip from Shawnee villages along the Canadian River, in August.

way, near Atlanta, Oct. 9, 1895, *E. Seler*, 1007 (G); Bivins, Oct. 15, 1940, *O. McGinnis*, 28011 (G). DENTON Co.: prairies, on Houston clay, between Benton & Aubrey, Sept. 22, 1937, *W. L. McCard* (US). UPSHUR Co.: open ground, deep fine sands, Big Sandy, Sept. 27, 1926, *E. J. Palmer*, 31749 (G, NY). DALLAS Co.: Dallas, Aug. 1876, *J. Reverchon* (NY). TARRANT Co.: in deep woods, Riverside, Sept. 12, 1926, *A. Ruth*, 1435 (US). GREGG Co.: without stated locality, Autumn, 1939, *C. L. York* (G). SMITH Co.: sandy fields and open places, in pine-oak woods, s. e. of Camp Fannin, 8 mi. n. e. of Tyler, Oct. 12, 1943, *H. E. Moore*, 556 (G). SAN AUGUSTINE Co.: San Augustine, *G. L. Crockett* (US). HOUSTON Co.: deep sands, open woods, Grapeland, Sept. 22, 1917, *E. J. Palmer*, 12842 (G). WALKER Co.: 8¾ mi. n. of Huntsville, Sept. 29, 1934, *V. L. Cory*, 10469 (G); in an old graveyard, vicinity of Huntsville, July 9-12, 1909, *R. A. Dixon*, 332 (G, NY); Timberline, 14½ mi. s. w. of Huntsville, Sept. 28, 1934, *H. B. Parks & V. L. Cory*, 10254 (T). MILAM Co.: sandy woods, 4 mi. east of Cameron, Aug. 4, 1929, *S. E. Wolff*, 11026 (US). HARDIN Co.: 5 mi. south of Silsbee, Oct. 15, 1936, *V. L. Cory*, 20035 (G). JEFFERSON Co.: Nome, Sept. 2, 1937, *G. L. Fisher*, 37159 (US). HARRIS Co.: 10½ mi. west of Laporte, Oct. 8, 1934, *Cory*, 11415 (G), Houston, Aug. 19, 1923, *G. L. Fisher*, 56 (US). AUSTIN Co.: Industry, 1894, *H. Wurzlów*, 30 (US). GONZALES Co.: Palmetto State Park, Aug. 1, 1941, *B. C. Tharp*, 145 (G); without locality, Oct. 10, 1940, *Tharp* (G). VICTORIA Co.: Aloe, Sept. 18, 1913, *F. W. Pennell* (NY). ATASCOSA Co.: sandy open ground, Pleasanton, Sept. 23, 1916, *E. J. Palmer* 10794 (US). NUECES Co.: Flour Bluff, 12 mi. south of Corpus Christi, Sept. 27, 1936, *S. G. & J. A. Drushel*, 10396, (NY). BROOKS Co.: Santa Fe Ranch, June 26, 1941, *Tharp* (G). KLEBERG or KENNEDY Co.: shell bank on Padre Island, Sept. 3, 1927, *Tharp* (G). OKLAHOMA. McCURTAIN Co.: deep, rich coastal plain woods, near entrance to cypress swamp 5 mi. southeast of Broken Bow, Oct. 2, 1940, *M. Hopkins*, 5566 (G).

Var. *TYPICA* forma *FISHERI* Standl. Differing from var. *typica* only in having the corolla, as well as the tips of the phyllaries, lemon-yellow.—Field Mus. Pub. Bot. xi. 276 (1936).—Known only from the type specimen, collected Aug. 26, 1934 by *G. L. Fisher* on hillsides near and on the highway, Copperas Cove, Coryell, Texas (Chicago).

Var. *carizzana*, var. nov., planta robusta ad 9 dm. alta, a var. *typica* rhizomate elongato conico 2.5 cm. diametro ad 15 cm. longo, phyllariis paullo longioribus (2.5 cm.), achaeniis 6 mm. longis, pappo 11-12 mm. longo diversa.—Medina, Wilson, Atascosa and Hudspeth counties, Texas.—TEXAS. MEDINA Co.: 3 mi. southwest of Devine, Oct. 12, 1934, *V. L. Cory*, 11726

(G, type); $2\frac{3}{4}$ mi. southwest of Derby, May 8, 1935, *H. B. Parks & Cory*, 12778 (T). WILSON Co.: Kicaster School, Oct. 22, 1934, *Parks & Cory*, 11877 (T), June 24, 1935, *Parks & Cory*, 15136 (T); post-oak woods, July 21, 1925, *Tharp* (G). ATASCOSA Co.: 9 mi. east of Poteet, Nov. 12, 1934, *Cory*, 11721 (G). HUDSPETH Co.: Sierra Blanca, Sept. 7, 1925, *Tharp*, 3772 (US).

Var. **flabellata** (Small), n. comb. Differing from var. *typica* only in having inner phyllaries with rounded, dilated, toothed, petaloid tips.—*Laciniaria flabellata* Small, Bull. Torr. Bot. Club, xxv. 472 (1898). *Liatris flabellata* (Small) K. Sch. Just, Bot. Jahresb. xxvi. pt. 1, 378 (1900). SOUTH CAROLINA. BEAUFORT Co.: dry, open woods, St. Helena Isl., Sept. 1894, *A. Cuthbert* (NY, type, US).

As stated in the introduction, plants growing [in the outcropping of the Eocene] in the Carrizzo sands of Medina, Bexar and Wilson counties of Texas are all said to have deeply penetrating root systems. As all specimens of *Liatris elegans* I have seen from these counties, as well as one from Poteet, Atascosa Co., where there is the same formation, have such very long underground systems, really remarkable in a species which has usually a relatively small globose corm, it has seemed advisable to make of these a variety, here called var. *carizzana*. The only other specimen of *L. elegans*, not coming from this region, with an elongate rootstock is one of Sept. 7, 1925, *B. C. Tharp*, no. 3772, from Sierra Blanca, Hudspeth Co., Texas (US), and concerning the soil in which it grew, Prof. B. C. Tharp¹ has written "deep sand and in that respect it resembles the Carizzo sand very much".

The type collection of *Laciniaria flabellata* Small provides the only examples of specimens with dilated, truncate, petaloid, inner phyllaries. Several other collections in successive years by the same collector from that island are quite like *Liatris elegans* var. *typica*, although the acuminate phyllaries are always quite conspicuous and somewhat serrate. On the sheet of a collection made on Sept. 21, 1902 (F), is the collector's observation "note gradation from typical acuminate bracts of *elegans* towards *flabellata*." Though the modification has seemingly been a very rare one, it is here given varietal rank under *L. elegans*.

A hybrid of this species and *L. tenuifolia* Nutt. was discussed under that species (see no. 15).

¹ By private communication.

SERIES VIII. PUNCTATAE. Plants mostly glabrous, with many-stemmed, generally erect, though sometimes recumbent spikes from an elongate, branching rootstock in two species and a globular one in other species; leaves numerous, mostly conspicuously punctate, linear and narrow; inflorescences generally densely spicate (rarely loose); heads slenderly cylindrical, 8–20 mm. long, 4–8-flowered (10–14 flowers in one species) with herbaceous appressed phyllaries; corolla-tube quite pilose within; achene 5–12 mm. long; pappus distinctly plumose, 8–15 mm. long.—From northern Mexico and Texas to the prairies of southern Canada and west to the east side of the Rocky Mts.

- a. Plants with a long underground rootstock....b.
 - b. Stems moderately stiff; leaves 1.5–5 mm. wide, conspicuously punctate, frequently ciliate; rootstock deeply penetrating; plants of wide range.....24. *L. punctata*.
 - b. Stems more slender and flexible; leaves 1–2 mm. wide, punctate, not ciliate; rootstock horizontal; in sandy prairies in Minnesota.....25. *L. densispicata*.
- a. Plants with a somewhat globular corm....c.
 - c. Heads 4–6-flowered....d.
 - d. Leaves 1.5–5 mm. wide, punctate, stiff; phyllaries mucronate-tipped; heads numerous or rarely few and distant.....26. *L. mucronata*.
 - d. Leaves 1–3 mm. wide, almost epunctate, soft; phyllaries acuminate; heads numerous.....27. *L. angustifolia*.
 - c. Heads 10–14-flowered, few, very distant on few-branched stems; leaves narrow, rather channelled and bract-like. 28. *L. bracteata*.

24. *LIATRIS PUNCTATA* Hook. Stems numerous, glabrous, striate, 1.5–8 dm. long, from a crown above an elongate, mostly branched rootstock, often penetrating long distances: leaves numerous, glabrous, rigid, linear, conspicuously punctate (but not to be distinguished from other species by this punctate character which is common to most); basal leaves 8–15 cm. long, 1.5–6 mm. wide, with cutinous margin bearing prominent cilia or only scantily so provided, gradually diminishing, below the beginning of a short spike or through the spike in the case of a longer one, to bracts shorter than the heads they subtend: inflorescence generally densely, sometimes loosely spicate, 6–30 cm. in length and 2–3 cm. in width when flowers are open, of usually crowded heads 1.5–2 cm. long, 8–10 mm. wide, containing 4–8 flowers; phyllaries herbaceous, thick, punctate and closely appressed except for the free tips, the outer short, rigid, ovate-acuminate or cuspidate, the inner oblong with acute or mucronate to lanceolate-acuminate tips, 10–14 mm. long and 1.5–2 mm. wide, prominently ciliate-margined in individuals having cilia on the margin of the leaves and correspondingly less ciliate to merely membranous-margined in others; corolla purple (rarely white) 9–12 mm. long, with the tube inside and filaments of stamens quite pilose; pappus distinctly plumose, 9–11 mm. long,

usually slightly exceeded in length by the corolla; achene 6–7 mm. long, ribbed and hairy.—Fl. Bor.-Amer. i. 306, t. 305 (1834). *Laciniaria punctata* (Hook.) O. Ktze. Rev. Gen. i. 349 (1891). *L. cylindrica* Torr., Ann. N. Y. Lyceum, ii. 210 (1824), as to plant described. *Laciniaria punctata* var. *turgida* Lunell, Amer. Mid. Nat. v. 241 (1918). *Laciniaria punctata* f. *corymbosa* Sheldon, Quart. Bull. Univ. Minn. i. 27 (1892) and f. *albiflora* Sheldon *ibid.* 26.

KEY TO VARIETIES

- a. Inflorescence dense. . . . b.
 - b. Stems stiff and short, 1.5–3 dm. tall; leaves 3–5 mm. wide, ciliate-margined; phyllaries prominently ciliate; of more northern plains and western mountains. var. *typica*.
 - b. Stems more slender, 4–8 dm. tall; leaves narrower, 2–3 mm. wide, and longer than in var. *typica*; leaves and phyllaries without prominent ciliate margins; Minnesota and Dakota, southward to the plains of Texas. var. *nebraskana*.
- a. Inflorescence lax; stems tall; leaves few and larger than in var. *typica*, 12.5–15 cm. long and 4–6 mm. wide, almost glabrous; heads fewer and scattered; mountains of Trans-Pecos Texas and northern Coahuila, Mexico. var. *mexicana*.

Var. **typica**. Stems 1.5–3 dm. long and stiff: basal leaves 8–10 cm. long and 3–5 mm. wide with prominent cilia along the cutinized margin: inflorescence a short spike 6–20 cm. in length, of crowded heads ca. 2 cm. long, containing 5–8 flowers: phyllaries prominently margined by long white cilia, inner ones lanceolate-acuminate or oblong with acute or mucronate tips.—*L. punctata* Hook. Fl. Bor.-Amer. i. 306 t. 305 (1834), sens. strict. *Liatris punctata* var. γ , Torr. & Gray Fl. N. Am. ii. 69 (1841).

From Manitoba and Saskatchewan south to Iowa and Kansas, and from Alberta southward along the eastern Rockies into New Mexico and Trans-Pecos Texas.—MANITOBA.¹ 62 H 14: dry gravelly knolls, Fort Garry (Winnipeg), Aug. 5, 1872, *J. Macoun*, 9851 (stem to right) (Ot). 62 G 3: on the open prairie, Chater, July 25, 1896, *J. Macoun*, 12227 (Ot). 62 G 4: on the hill s. of the lake, Killarney, Aug. 3, 1896, *J. Macoun*, 12196 (Ot). 62 G 16: Portage la-Prairie, Aug., 1896, *J. K. McMorine* (Q); 62 K 1: Rivers, Aug. 7, 1933, *H. H. Brown* (HB). MINNESOTA. WASHINGTON Co.: St. Paul & St. Anthony, 1861, *T. J. Hale* (G). OTTER TAIL Co.: dry prairies, Perham, Aug. 14, 1910, *Z. L. Chandonnet* (US). HENNEPIN Co.: dry rocky hillside, Fort Snelling, Sept. 1, 1888, *E. A. Mearns*, 140 (NY, US); Fort Snelling to rivers of north, *Dr. Jarvis* (G). NOBLES Co.: dry hills, Adrian, Aug. 22, 1895, *F. W. Hunnewell* (G). IOWA. PLYMOUTH Co.: Akron, Sept. 1909, *Mrs. E. Bredall* (US). WOODBURY Co.: Sioux City, Aug. 29, 1896, *L. H. Pammel*, 39 (NY, US). NORTH

¹ Localities in Manitoba, Saskatchewan and Alberta are indicated by standard notation with reference to sheets of the National Topographical Series, Dept. Mines & Resources, Ottawa, Canada.

DAKOTA. BOTTINEAU Co.: Bottineau, Aug. 24, 1890, *C. B. Waldron* (NY). WARD Co.: on roadside, Minot, Aug. 18, 1931, *Miss R. Weikert*, 1 (NY). BENSON Co.: prairies, Leeds, Aug. 28, 1899, *J. Lunell* (G); in dry prairies, Leeds, Sept. 8, 1909, *J. Lunell* (US); Butte, *J. Lunell*, Oct. 21, 1908 (US), Oct. 2, 1908 (NY). BURLEIGH Co.: along Missouri R., near Bismarck, Aug. 26, 1917, *F. P. Metcalf*, 369 (G). STARK Co.: Dickinson, Sept. 8, 1908, *W. R. Holgate* (G). SOUTH DAKOTA. Co. undetermined: western part of State, Aug. 1891, *T. A. Williams* (US). ROBERTS Co.: clay banks, Big Stone Lake, Aug. 1922, *W. H. Over*, 14351 (US). GRANT Co.: virgin prairie, Troy, near Big Stone Lake, Aug. 4, 1940, *P. Johnson*, 68 (G, NY). DAY Co.¹: sandy, arid prairie heights, around the Sioux, lower St. Peter R., near Fort Pierre, Missouri Hills, dividing ridges between Missouri & Mississippi waters, Aug. 20, 1839, *Nicollet's N. W. Exped.*, 272 ("var. γ ") (US); (without stated locality), *Nicollet's N. W. Exped.*, *C. A. Geyer* (G "var. γ " (NY "var.")); probably DAY Co.: Oak Gulch, Sept. 5, 1896, *L. W. Carter* (NY). BUTTE Co.: Belle Fourche, July 30, 1926, *H. E. Hayward*, 31 (NY). BROOKINGS Co.: White, Aug. 29, 1906, *Miss F. N. Vasey* (US). KINGSBURY Co.: Iroquois, Aug. 9, 1894, *J. J. Thornber* (G). WASHABAUGH Co.: Pine Ridge Reservation, Aug. 1911, *S. S. Visher*, 2340 (NY). SHANNON Co.: Wolf Creek, near Pine Ridge Agency, Aug. 9, 1911, *S. S. Visher*, 2207 (NY). FALL RIVER Co.: Hot Springs, Sept. 1893, *Lieut. W. E. Safford* (US); Hot Springs (alt. 3500'), Aug. 3, 1892, *P. A. Rydberg*, 754 (US). NEBRASKA. THOMAS Co.: Thedford (excepting tall stem to right), Aug. 7, 1889, *H. I. Webber* (NY); on sandhills, on Middle Loup R., near Thedford Aug. 19, 1893, *P. A. Rydberg*, 1706 (US). ADAMS Co.: Hastings, Sept. 16, 1886, *Prof. Thompson* (G). KANSAS. CHEYENNE Co.: near Catholic Church, St. Francis, Sept. 7, 1936, *Mrs. J. M. Steller*, 91 (NY). DOUGLAS Co.: Lawrence, *W. C. Stevens* (US). WALLACE Co.: Wallace, Aug. 22, 1884, *G. W. Letterman* (NY). HAMILTON Co.: vicinity of Syracuse, Sept. 14, 1912, *J. N. Rose & W. R. Fitch*, 17013 (NY, US). STEVENS Co.: Moonlight, Aug. 15, 1893, *C. H. Thompson*, 174 (NY, US). MORTON Co.: without stated locality, July 28, 1891, *M. A. Carleton*, 353 (US). SASKATCHEWAN. Without stated locality: 1858, *Palliser's Br. N. Amer. Expl. Exped.*, *E. Bourgeau* (G, NY); *ex Herb. Musei Brit. Douglas*, 9849 (Ot). Exact

¹ From Senate Report intended to illustrate a map of the Hydrographical Basin of the Upper Mississippi River made by I. N. Nicollet, Feb. 16, 1841, Washington, 1843, p. 53: "I was at St. Peter's when I made up my mind to visit the sources of the Mississippi"—"Left St. Peter's on July 26, 1836"—"on July 29, I was ascending the Mississippi". No dates are given in the further description of travel but from the map they were, on Aug. 19, west of Big Stone Lake near what is called Cold Spring Lake—mouth of the Sioux River. This would seem to be about Day County, S. Dakota (see also following discussion).

region undetermined, Saskatchewan plains, Aug. 3, 1872, *J. Macoun* (US without no.), 821 (NY). 72 P 14-13: Little Lake Manito, July 21, 1906, *J. Macoun* & *W. Herriot*, 77087 (G, Ot). 73 B 2: along the G. T. Rwy., 15 mis. w. of Saskatoon, July 29, 1906, *J. Macoun* & *W. Herriot*, 77086 (NY, Ot). 62 L 12: gravelly knolls in prairies, Indian Head, Sept. 16, 1891, *J. Macoun*, 9848 (Ot); 72 I 6: prairies, Moosejaw, July 31, 1904, *F. W. Johnson*, 972 (US). 72 J 16: prairies, Brownlee, Aug. 7, 1913, *F. W. Johnson*, 1259 (NY). 62 E 16: Moose Mountain, Aug. 1884, *J. Macoun* (US). 72 K 2: prairies, Sidewood, Assiniboine, Aug. 26, 1892, *F. E. Floyd* (NY). 62 F 12: Redvers, Aug. 19, 1909, *G. E. Copeland* (Q). 62 M I: Yorkton, Aug. 19, 1908, *W. Crawford* (Q). ALBERTA. Without stated locality: prairies, Aug. 21, 1913, *F. W. Johnson*, 1065 (US). 83 A 4: Red Deer, Aug. 2, 1917, *C. H. Young*, 92730 (Ot). 74 M 11: rwy. track, Scotfield, Aug. 10, 1926, *A. H. Brinkman* 2541 (US); 82 P: dry soil, prairie hills (alt. 2200'-2500'), Rosedale Coulee, Aug. 6, 1915, *Miss M. E. Moodie*, 1170 (G, NY, US). 82 O 1: dry hills, Calgary, Aug. 19, 1913, *Miss M. E. Moodie* (US); dry ground & prairies, vic. of Calgary, Elbow R. Valley (alt. 3400'-3600') Aug. 6, 1913, *Miss M. E. Moodie*, 28 (NY); grassy hills ca. 13 mis. s. of Calgary, Aug. 1, 1941, *C. L. Hitchcock* & *J. S. Martin*, 7853 (NY). ca. 82 H 11: middle fork of Old Man R., Rocky Mts., Aug. 14, 1883, *Dawson*, 9850 (Ot). 82 H 11: near irrigation ditch, s. of Standoff (s. of MacLeod), Aug. 15, 1929, *E. H. Moss*, 410 (G). 82 H 12: in the valley of Old Man R., Fort McLeod, Aug. 24, 1897, *J. Macoun*, 22766 (Ot); prairies, Fort McLeod, Aug. 5, 1895, *J. Macoun*, 10829 (Ot); MacLeod, Aug. 1923, *R. H. Dixon*, 432 (NY); dry slope of gravelly ridge, w. of Pincher Creek, July 26, 1939, *E. H. Moss*, 62 (G); Oldham R., n. of Pincher, Aug. 2, 1939, *E. H. Moss*, 250 (G). MONTANA. Without stated locality: 1883, *L. F. Ward* (US). Co. undetermined: prairie, upper Missouri, Aug. 19, 1864, *T. M. Rothammer*, 477 (US); Mountain Sheep Buttes, Aug. 11, 1909, *V. L. Bailey* (US); without stated locality, Aug. 10, 1890, *J. W. Blankinship*, 131 (US); upper Missouri, Aug. 27, 1864, *T. M. Rothammer*, 490 (US). SHERIDAN Co.: Westby, Aug. 12, 1928, *Miss E. Larsen*, 211 (US). DAWSON Co.: Colgate, near Glendive, Sept. 6, 1892, *J. H. Sandberg*, 1020 (US); Seven Mile Creek, 15 mis. above Glendive, Aug. 11, 1883, *L. F. Ward* (US). CASCADE Co.: Belt Creek, July 1883, *F. W. Anderson* (US); (albino) Great Falls, Aug. 24, 1891, *R. S. Williams*, 76 (US). LEWIS & CLARK Co.: in vacant lots, Helena, Sept. 2, 1908, *B. T. Butler*, 649 (NY); White's Gulch, near Helena, Aug. 22, 1882, *W. M. Canby* (G); 6 mis. s. e. of Helena, Aug. 12, 1931, *J. T. Howell*, 7897 (NY). TREASURE Co.: dry ground near Custer, Aug. 9, 1912, *H. D. House*, 4900 (US). MUSSELSHELL Co.: plains of Musselshell R.,

Sept. 2, 1896, *J. H. Flodman*, 817 (NY, US). JEFFERSON Co.: rocky slopes, above Jefferson R., 10 mis. e. of Whitehall, Aug. 5, 1941, *J. F. Brenckle & L. H. Shinnors*, 41-061 (G). PARK Co.: Livingston, Yellowstone National Park, *Mrs. E. W. Scheuber*, Aug. 2, 1901 (US), 1901, 20 (NY). GALLATIN Co.: Bozeman, Aug. 17, 1900, *E. J. Moore* (G), Sept. 2, 1902, *W. W. Jones* (US); dry uplands, Bozeman, Aug. 24, 1905, *J. W. Blankinship*, 284 (US); Cinnabar, Yellowstone River, July, 1884, *F. Tweedy* (US). WYOMING. Without stated locality: July 25-30, 1870, *Hayden's U. S. Geol. Survey* (US). Co. undetermined: sources of the Platte, *Dr. James*¹ (NY); Aurora, July 30, 1900, *W. Granger* (NY). SHERIDAN Co.: Dayton (alt. 4000'), Sept. 1899, *F. Tweedy* 2072 (NY). PARK Co.: Clark's Fork R., Aug. 1881, *W. H. Forwood*, 21 (G). WESTON Co.: Cambria Canon, July 22, 1896, *A. Nelson*, 2529 (NY). JOHNSON Co.: dry plains near Rock Creek (alt. 6500'), Aug. 1, 1934, *R. C. Rollins*, 712 (G, NY); Buffalo (alt. 4000'-5000'), Sept. 1900, *F. Tweedy*, 3146 (NY). NIOBRARA Co.: dry plains, near Kirtly (alt. 5000'), Aug. 3, 1931, *R. C. Rollins*, 36 (NY). PLATTE Co.: Cottonwood Canon, Aug. 4, 1895, *A. Nelson*, 1564 (G, NY, US);² North Fork of the Platte River,² 1843-44, *Fremont's Exped. to California* (G, NY, US). ALBANY Co.: Dale Creek, Aug. 24, 1908, *Mrs. J. Clemens* (G); 15 mis. s. w. of Laramie, Aug. 22, 1901, *E. D. Merrill & E. N. Wilcox*, 1169 (G, US); dry bench lands, Centennial, Aug. 5, 1900, *A. Nelson*, 7952 (G, NY, US); Bear Creek, ca. 2 mis. from Eagle Rock & 4 mis. from Laramie Peak, Aug. 22, 1891, *C. Schuchert* (US). COLORADO. Without stated locality: 1870, *E. L. Greene* (G), 1878, *P. J. Mohr* (US 720072), *L. F. Ward* (US 134488). Co. undetermined: meadow at foothills of Colorado (alt. 6500'), Aug. 9, 1890, *C. S. Crandall*, 272 (US); Stanley's Ranch, *Mrs. C. N. S. Horner* (G). LARIMER Co.: Estes Park, Aug. 11, 1906, *E. L. Johnston*, 218 (US); Livermore, Aug. 22, 1900, *G. E. Osterhout*, 2231 (NY). BOULDER Co.: mts., Boulder, Sept. 3, 1895, *C. L. Shear*, 4456 (US); near Boulder, Oct. 1, 1900, *F. Ramaley*, A201 (US); Boulder, Aug. 1891, *Dr. E. Penard*, 265 (NY); mts. between Sunshine and Ward (alt. 8000'-9500'), Aug. 1902, *F. Tweedy*, 4936 (NY). ARAPAHOE Co.: North Denver (plant to left), Aug. 16, 1910,

¹ This specimen, though without locality of collection on the Herbarium sheet, would seem to be that cited as *Liatris cylindrica* Torr. Ann. N. Y. Lyceum ii. 210 (1827) No. 204, for which is given, "sources of the Platte". (See also following discussion.)

² From report of Fremont's Expedition, Washington, 1845, the date is Aug. 29, and place of collection, Black Hills of the Platte. Following the account of the itinerary "Aug. 27, on their return they halted where they had taken dinner on July 27". By the map this was where Deer Creek enters the Platte, and is where Glenrock, Converse Co., Wyo. now is. Since they reached Fort Laramie on the last day of August the collection of *L. punctata* would be between Glenrock and Fort Laramie, possibly Platte Co..

Miss A. Eastwood, 44 (US); near Denver, Dec. 1, 1874, *C. Mohr*, (US); dry plains, n. w. of Denver (alt. 1500 m.), Sept. 17, 1901, *L. M. Underwood & A. D. Selby*, 529 (NY). JEFFERSON Co.: Golden, Oct. 8, 1882, *N. L. Britton* (NY); Golden (alt. 5500'), Aug. 21, 1884, *C. S. Sheldon*, 297 (NY); Morrison (alt. 6500'), Aug. 7, 1878, *M. E. Jones*, 546 (NY, US). DOUGLAS Co.: Buffalo Creek Canon, Sept. 14, 1909, *H. H. Rusby* (NY). EL PASO Co.: near Colorado Springs (alt. 6000'), Sept. 22, 1895, *S. L. Clarke*, 7 (NY); Colorado Springs (alt. 6000'), Sept. 19–21, 1895, *Mrs. S. L. Clarke* (NY). GUNNISON Co.: Gunnison, 1896, *F. Clements*, 229 (NY). CUSTER Co.: West Cliff, Aug. 13, 1896, *C. L. Shear*, 3458 (NY). OTERO Co.: vicinity of La Junta, Sept. 16, 1912, *J. N. Rose & W. R. Fitch*, 17064 (NY, US). HUERFANO Co.: Cucharas Valley, near La Veta (alt. 7000'), Sept. 26, 1900, *F. K. Vreeland*, 683 (NY). LAS ANIMAS Co.: Raton Mts., Sept. 1, 1898, *E. O. Wootton* (US); Wootton, Sept. 11, 1909, *H. H. Rusby* (NY). NEW MEXICO. UNION Co.: Folsom, Aug. 30, 1903, *A. H. Howell*, 165 (US). COLFAX Co.: Colfax, Aug. 13, 1910, *E. O. Wootton* (US); open, pine-oak woods top of Raton Pass, alt. 7800 ft., Aug. 18, 1941, *U. T. Waterfall*, 3502 (G); vicinity of Raton, Oct. 27, 1913, *J. N. Rose & W. R. Fitch*, 17546 (NY, US); Bartlett Ranch, Aug. 31, 1913, *Wootton* (NY); Vermejo Park (alt. 7600 Ft.), Aug. 31, 1913, *Wootton* (US), July–Aug., 1894, *Mrs. O. St. John*, 100 (G); vicinity of Ute Park, alt. 2200–2900 m., Sept. 21, 1916, *P. C. Standley*, 14240 (G). SAN MIGUEL Co.: 15 mi. northwest of Las Vegas, Aug. 30, 1934, *G. J. Goodman*, 2322 (G, NY, O); near Bernal, alt. 6300 ft., Aug. 27, 1903, *V. L. Bailey*, 546 (US). BERNALILLO Co.: among rocks and on hillsides, Canyon Media, Sandia Mts., *Miss C. C. Ellis*, 284 (US); dry flats, east slope Sandia Mts., alt. 7500 ft., *Ellis*, 284 (US). LINCOLN Co.: Block Ranch, north of Capitans, Aug. 31, 1900, *F. S. & E. S. Earle*, 384 (NY, US); El Capitan Mts., alt. 8000 ft., July 7, 1928, *Earle* (NY).

Var. *TYPICA* forma **coloradensis**, f. nov., phyllariis mucronatis purpurascens, foliis plerumque angustioribus.—Chiefly Colorado and New Mexico.—COLORADO. Without stated locality: 1862, *E. Hall* (US), *C. Mohr* (US, 783573). Co. undetermined: sterile plains (alt. 5700'), Aug. 20, 1884, *C. S. Sheldon*, 297 (US). WELD Co.: New Windsor, Aug. 20, 1901, *G. E. Osterhout*, 2339 (NY, US); Greeley, Aug. 11, 1881, *L. F. Ward* (US); Dent, Aug. 31, 1917, *W. W. Jones*, 535 (G). LARIMER Co.: Fort Collins (alt. 5000'), July 29, 1891, *J. M. Cowan* (NY); Fort Collins, Aug. 25, 1896, *C. F. Baker* (NY); College Farm, Col. Agric. College, July 29, 1892, *C. S. Crandall* (US); along rwy., s. of Agric. College, Aug. 23, 1898, State Agric. College, 2975 (NY, US); Estes Park, Aug. 1894, *Mrs. J. M. Milligan* (US). BOULDER Co.: without stated locality, Aug. 1882, *H. N. Patterson & F.*

Beatty, 58 (US). ARAPAHOE Co.: Melvin, Aug. 13, 1890, *E. L. Hughes*, 13 (G); plains, Denver, Sept. 12, 1888, *W. G. Smith* (US); North Denver, Aug. 16, 1910, *Miss A. Eastwood*, 44 (G, US plant to right); dry soil, Denver, Aug. 29, 1916, *I. W. Clokey*, 2682 (G, NY). JEFFERSON Co.: Golden, road up to Lookout Mt., Aug. 28, 1916, *E. L. Johnston*, 218B (G). LINCOLN Co.: Hugo, July 28, *C. D. Marsh* (US). EL PASO Co.: moist meadow among hills, 4 mis. s. of Palmer Lake, Aug. 7, 1941, *U. T. Waterfall*, 3203 (G); Colorado Springs, Aug. 20, 1889, *B. W. Evermann* (US, 310558 & 617864), Oct. 15, 1903, *W. C. Sturgis* (G, US), Oct. 1903, *Mrs. J. M. Milligan* (US); Colorado Springs (alt. 1900 m.), Sept. 22, 1915, *W. W. Eggleston*, 12031 (US); dry plains, Colorado Springs, Aug. 6, 1892, *C. S. Sheldon*, 473 (NY, US); Pike's Peak, Cheyenne Mt., north slope, July 28, 1896, *E. A. Bessey* (NY); Pike's Peak, Aug. 23, 1887, *S. M. Tracy & Evans*, 801 (stem to right) (NY); Garden of the Gods, Aug. 8, 1908, *C. E. Bessey* (US); dry hillsides, Colorado Springs, Aug. 3, 1939, *J. H. Ehlers*, 7785 (G); dry plains, near foothills, Aug. 11, 1897, *C. S. Crandall*, 2974 (G); "The Mesa", 3.5 mis. n. w. of Colorado Springs, Aug. 7, 1924, *R. Bacigalupi*, 678 (G); Manitou (alt. 2100 m.), Aug. 16, 1901, *F. E. Clements & E. S. Clements* 72 (G, NY, US). CHAFFEE Co.: Salida, Aug. 28, 1892, *Miss I. Mulford* (G, NY). PUEBLO Co.: on plains about Pueblo, 1883, *R. W. Woodward* (G). HUERFANO Co.: St. Mary's, *Mrs. C. N. S. Horner* (G). OKLAHOMA. CIMARRON Co. (near New Mexico line): s. of Black Mesa $1\frac{1}{2}$ mis. w. of Kenton, Aug. 6, 1941, *U. T. Waterfall*, 3176 (G). NEW MEXICO: Co. undetermined: from Cottonwood Creek¹ of Ark. to San Miguel, Aug. 1847, *A. Fendler*, 299 (G). SAN DOVAL Co.: hard clay soil, Nara Visa, Sept. 8, 1910, *G. L. Fisher*, 68 (US); dry open grassy ridges, Jemez Springs area, Aug. 24, 1931, *A. Nelson*, 11704 (G). SAN MIGUEL Co.: Las Vegas, June, 1920, *Bro. Anect*, 1 (NY); Pecos, *S. S. Holman* (US); near Pecos (alt. 6700'), Aug. 15, 1908, *P. C. Standley*, 4958 (US). QUAY Co.: Llano Estacado, Sept. 16, 1853, *Whipple Exped. J. M. Bigelow* (NY (US 2 stems to left)); Guadalupe Mts. (alt. 6000'–7000'), Sept. 3–6, 1915, *A. S. Hitchcock* (US); hard clay, Nara Visa, Sept. 8, 1910, *G. L. Fisher*, 68 (US). DONA ANA Co.³: valley of Rio Grande, Mexican Boundary Survey, 450 (NY, US).

¹ Plant. Fendl. gives this region for the collection of the specimen no. 299, *L. punctata*.

² According to Bigelow.—Report on Lieut. Whipple's Expedition (1857), p. 96, Sec. 4. *L. punctata* was collected in rocky prairies from the Canadian River, Aug. 26, to the Llano Estacado, August to September. On p. 3, Llano Estacado is described as "the space in our route between Valley River and Fossil Creek, near Tucumari hills. This is a dry and generally timberless tract of country extending over a distance of about one hundred and ninety miles". The region now would probably be included in Quay Co., New Mexico.

³ Plant. Nov. Thurb. Gray, Mem. Amer. Acad. Ser. 2, v. 297–328 (1855), explains the route followed.

Var. **nebraskana**, var. nov., varietatem typicam simulans caudice subterraneo ad 4 dm. longo caulibus multis, plerumque minus rigidis et altioribus (2.5–5 dm. maturitate, 1–5 dm. juventute); foliis plerumque angustioribus, 2–3 mm. latis, flexilioribus marginibus aut haud aut leviter ciliatis; inflorescentia 10–25 cm. longa; capitulis densis ca. 1.5 cm. longis 4–6 floris; phyllariis plerumque submembranaceis rariter marginibus breviciliatis, interioribus lanceolato-acuminatis vel oblongis apice acuto.—*L. punctata* Hook. var. β . Torr. & Gray Fl. N. Am. ii. 69 (1841). *L. resinosa* sensu DC. Prodr. v. 129 (1836), not Nutt.

TYPE: on north hillsides, south of Chadron, Dawes Co., Nebraska, Sept. 1, 1936, *W. L. Tolstead* (G).

Wisconsin, Illinois and Arkansas, west to South Dakota, Colorado, and New Mexico.—WISCONSIN. ST. CROIX Co.: prairie hillside, 2 mis. w. of Robert, Aug. 6, 1934, *N. C. Fassett*, 16969 (G). ILLINOIS. DUPAGE Co.: Rwy. Lisle, July 8, 1925, *A. J. Prisc*, 26 (US). MINNESOTA. POPE Co.: dry prairies, Montevideo, Aug. 11, 1897, *L. R. Moyer* (NY). HENNEPIN Co.: St. Paul, 1861, *T. J. Hale* (G); sandy soil, Aug. 1890, *J. H. Sandberg* (NY); Minneapolis, Aug. 1868, *W. M. Canby*, 542 (US), Sept. 15, 1891, *J. H. Sandberg* (US). MARTIN Co.: without stated locality, Sept. 10, 1892, *R. I. Cratty* (G). IOWA. Without stated locality: *R. I. Cratty*. (US). EMMET Co.: dry sandy knolls, Aug.–Sept. *R. I. Cratty* (NY). CLAY Co.: gravelly prairie, cemetery in Dickens, Freeman Twsp., Sect. 17, Aug. 4, 1934, *Miss A. Hayden*, 10528 (NY). WOODBURY Co.: Sioux City, Aug. 29, 1896, *L. H. Pammel*, 39 (G). MISSOURI. SHANNON Co.: broad slopes & bald tops of loess hills, near Montier, Sept. 3, 1920, *E. J. Palmer*, 18944 (G). TANEY Co.: limestone ledge, Malva, Sept. 17, 1924, *E. J. Palmer*, 26190 (NY). ARKANSAS. Without stated locality: 1839, *Latrobe* (NY). CARROLL Co.: limestone ledges, Eureka Springs, Sept. 28, 1913, *E. J. Palmer*, 4514 (US). SOUTH DAKOTA. Without stated locality: ¹*Nicollet's N. W. Exped. C. S. Geyer* "var. B" (NY). CUSTER Co.: Custer (alt. 5500'), Aug. 1, 1892, *P. A. Rydberg*, 754 (NY). Probably BENNETT OR WASHABAUGH Co.: Bear Creek (albino), Aug. 1891, *T. A. Williams* (US). NEBRASKA. CHERRY Co.: on hardlands, Fish Hatcheries, Valentine, Aug. 15, 1936, *W. L. Tolstead*, 702 (G). DAWES Co.: on north hillsides, s. of Chadron, Sept. 1, 1936, *W. L. Tolstead*, 800 (G, type). THOMAS Co.: on sandhills, on Middle Loup R., near Thedford, Sept. 13, 1893, *P. A. Rydberg*, 1761 (NY); Thedford (1 tall stem to right), Aug. 7, 1889, *H. I. Webber* (NY). BUFFALO Co.: without stated locality, Aug. 1922, *W. E. B.* (O). ADAMS Co.: Ayr, Aug. 31, 1905, *J. M. Bates* (G). KANSAS. Without stated locality:

¹ See also following discussion.

latitude 39°, 1868, *E. Hall* (US). RILEY Co.: prairie, Sept. 12, 1895, *J. B. Norton*, 213 (G, NY, US); prairie, Sept. 12, 1895, *J. B. Norton*, 212 (G, US). JOHNSON Co.: s. of Holliday, Aug. 23, 1895, *C. Rowe*, 980 (NY). LINN Co.: prairie, Parker, Oct. 21, 1916, *G. W. Stevens*, 4346 (NY). SEDGWICK Co.: Wichita, Sept. 1905, *S. F. Poole*, 226 (G); high prairies, Wichita, Sept. 9, 1890, *B. B. Smyth*, 254 (US). NEOSHO Co.: near Chanute, Sept. 23, 1896, *L. F. Ward* (US); Brookville, Sept. 1888, *R. G. Eccles* (NY). PRATT Co.: vicinity of Pratt, Sept. 23, 1912, *J. N. Rose & W. R. Fitch*, 17149 (US). MONTGOMERY Co.: dry prairies, Cherryvale, Sept. 16, 1900, *F. W. Johnson* (NY). COWLEY Co.: Winfield, Aug. 1911, *Miss F. N. Vasey* (US). BARBER Co.: Medicine Lodge, 1906, *C. R. Ball*, 1081 (US). OKLAHOMA Co. undetermined: open rocky hills, Sansbois Mts., Aug. 1891, *C. S. Sheldon*, 293 (US). CREEK Co.: Sapulpa, Sept. 19, 1894, *B. F. Bush*, 216 (G, NY, US). LOGAN Co.: near Guthrie, Oct. 21, 1916, *R. Keyser*, 6087 (NY). KINGFISHER Co.: Huntsville, Sept. 20, 1895, *Miss L. A. Blankinship* (US). OKLAHOMA Co.: sandstone hillside, Oklahoma City, Aug. 29, 1937, *U. T. Waterfall* (NY). CLEVELAND Co.: Norman, Sept. 25, 1914, *W. H. Emig*, 347 (US); 10 mis. e. of Norman, Aug. 20, 1903, *A. H. Van Fleet* (US); 2 mis. e. of Norman, *W. E. Bruner* (US). MURRAY Co.: Platt National Park, Sulphur, July 24, 1935, *G. M. Merrill*, 979 (NY). COLORADO Co. undetermined: dry plains, *C. Mohr* (US, 783573). LARIMER Co.: Estes Park, Aug. 11, 1905, *E. L. Johnston*, 218A (NY). BOULDER Co.: Boulder, Sept. 1895, *P. A. Rydberg* (NY). DENVER Co.: Denver, Sept. 23, 1887, *S. M. Tracy & Evans*, 902 (NY). EL PASO Co.: Colorado Springs (alt. 1900 m), Sept. 22, 1915, *W. W. Eggleston*, 12027 (US); Colorado Springs, 1903, *H. L. Shantz*, 585 (US); Pike's Peak (plant to left), Aug. 23, 1887, *S. M. Tracy & Evans*, 80 (NY). NEW MEXICO Co. undetermined: from Cottonwood Creek of the Arkansas to San Miguel, Aug. 1847, *A. Fendler* (328)¹ (G). COLFAX Co.: Johnson's Mesa, Aug. 16, 1910, *E. O. Wooton* (US). SAN MIGUEL Co.: vicinity of Las Vegas, Sept. 11, 1895, *E. N. Plank* (NY). QUAY Co.: Llano Estacado, Sept. 16, 1853, *Whipple Exped.*, *J. M. Bigelow* (US, stem to right).

Var. **mexicana**, var. nov. a varietate typica differt plantis altissimis 5–8.5 dm. altis, plerumque caulibus paucis e caudice crasso subterraneo vel ovato vel subelongato; foliis paucis plerumque omnino glabrescentibus nitidis distantibus et maioribus 12.5–15 cm. longis 4–6 mm. latis; inflorescentia laxa, internodiis 1–2 cm. longis; capitulis 1.5–2 cm. altis, 5–6-floris; phyllariis vel ovato-acuminatis vel mucronatis, marginibus ciliatis aut sine ciliis.

¹ Plant Fendl. gives this date and region for the collection of *L. punctata* (328), which bracketed number is the one under which it was distributed.

TYPE: dry, gravelly places, among clumps of scrub oak, end of road from T. Armendaiz north into Sierra del Pino, Coahuila, Aug. 20–26, 1940, *I. M. Johnston & C. H. Mueller*, 457 (G).

Known from southwestern Texas, and from Coahuila, San Luis Potosí and Tamaulipas, Mexico.—TEXAS. SCHLEICHER Co.: s. of Eldorado, Nov. 1, 1942, *H. R. Reed*, 40902, 40903 (G). EDWARDS Co.: Ranch Expt. Sta., pasture G, *V. L. Cory*, 5010 (G), Oct. 16, 1932, *V. L. Cory* 5011¹ (G). EL PASO Co.: Guadalupe Mts., Sept. 1881, *V. Havard* (US, 134404), 1881, *V. Havard*, 56 (US 220338). JEFF DAVIS Co.: side of hills, pass of the Limpia,² Aug. 24, 1849, *Exped. from West Texas to El Paso*, *C. Wright*, 246 (G, US); dry exposed slopes (alt. 1800 m.) Mt. Locke, Davis Mts., Sept. 1936, *L. C. Hinckley* (G); foothill on s. w. of Mt. Locke, Davis Mts., on road up to Observatory (alt. 1850 m.), Sept. 1936, *L. C. Hinckley*, 884 (NY). BREWSTER Co.: Pine Canyon (5000'), Chisos Mts., Sept. 5, 1937, *E. Marsh*, 330 (G); Chisos Mts., July 28, 1931, *C. H. Mueller*, 8176 (G, NY); Blue Creek, Chisos Mts., June 19, 1931, *C. H. Mueller*, 8176 (G); dry soil, in wide valleys, Chisos Mts., Aug. 20, 1915, *M. S. Young* (G); grassy slope of College Hill, Alpine, Sept. 20, 1935, *O. E. Sperry*, T. 354 (US); frequent on College Hill, Alpine, Aug. 20, 1936, *B. A. Warnock*, 1179 (G). NEW MEXICO. BERNALILLO Co.: dry flats, w. slope of Sandia Mts., near Allen's Ranch (alt. 7000'), Aug. 10, 1914, *Miss C. C. Ellis*, 284 (NY, US). MEXICO. COAHUILA: dry gravelly places among clumps of scrub oak, end of road from T. Armendaiz, north into Sierra del Pino, Aug. 20–26, 1940, *I. M. Johnston & C. H. Mueller*, 457 (G, type); Monclova, Feb.–Oct. 1880, *E. Palmer*, 419 (G); 100 mis. n. of Monclova, Feb.–Oct. 1880, *E. Palmer*, 420 (G, US); valle de los Guajes, e. of the Sierra de la Encantada, 10 mis. s. of Rancho Buena Vista, Sept. 3, 1941, *R. M. Stewart*, 1354 (G). TAMAULIPAS: in dry broad arroyo, 19 km. s. w. of Misquihuana, rd. to Palmillas, Aug. 11, 1941, *L. R. Stanford*, *K. L. Retherford & R. D. Northcroft*, 900 (G (3 stems to left), NY). SAN LUIS POTOSI: Sierra Mts., en route San Luis Potosi to Tampico, Dec. 1878–Feb. 1879, *E. Palmer*, 1085 (G); Bagre, Minas de San Rafael, July 1911, *C. A. Purpus*, 5144 (G, US).

Liatris punctata has probably the widest geographic range of any species of the genus, extending from about the 53rd parallel of latitude in the western Canadian provinces, southward into northern Mexico, though not east of the Mississippi. Hooker's description covers Drummond's specimen from the plains of Saskatchewan and that of Douglas from the Red River and

¹ This specimen is fasciated, probably as the result of some injury.

² In Gray, *Plant. Wright*. p. 83 (1852), no. 246, is stated to be from Pass of the Limpia, which is in Jeff Davis Co., Texas.

Eagle Hills, Sask., Aug. 4, 1827 (Kew), of which photographs have been seen. This plant, as it occurs in Canada from Manitoba to Alberta and for the most part in those states just south of the border (North Dakota, Montana and Wyoming) and southward along the eastern Rockies to New Mexico, closely resembles the type and is here called var. *typica*. A variety of more slender and often taller habit, with narrower leaves, and slightly smaller heads, occurs more generally in the plains states from the southern border of the Dakotas to the Oklahoma-Texas border-region, and is here separated as var. *nebraskana*.

Torrey and Gray (Fl. N. Amer. ii. 69 (1841)) recognized two varieties of which γ , described as having "leaves conspicuously ciliate with hispid hairs; inner scales of the involucre purplish above", probably belongs with var. *typica*, though the involucre is not necessarily colored. In contrast to var. γ , they recognized as var. β , plants with "leaves nearly all very narrowly linear; the margins remotely ciliate or naked; scales of the involucre narrower, tapering somewhat gradually into a cuspidate-acuminate point, at least the inner ones; spike usually short; stem often slender". Since the writers referred to collections of the Nicollet N. W. Expedition, by Charles A. Geyer (NY "var. β "), it is possible to recognize as this latter variety the one that occurs more generally in the central plains-states and we are calling it var. *nebraskana*. In the National Herbarium are two specimens of which one, of Aug. 20, 1839, Nicollet's N. W. Exped., no. 272, "var. γ ", from the sandy and prairie heights, around the Sioux, lower St. Peter R., near "Fort Pierre" is apparently var. *typica*, as are also those at the Gray and New York Herbaria, without locality, labelled "var. γ " and "var. " respectively. Another specimen, with the rootstock 10 cm. long (of Aug. 20, 1839, Nicollet's N. W. Exped., no. 272, "fere var. β T. & G.", from sandy arid prairie heights, around the Sioux, Upper St. Peter R., near Fort Pierre (US)), as well as one "fere β " (G), represent the more slender variety in the character of the narrow leaves. However, by the size of the heads, and ciliate-margined phyllaries, they match var. *typica* of the western Canadian prairies. Thus the "fere var. β ", may be translated as an intermediate between the two varieties. By the report and maps of this expedition (see footnote to citation), these specimens would have been collected

about Day Co., South Dakota. Thus it seems evident that both var. *typica* and var. *nebraskana* are represented in the collections of that expedition which reached a region where the range of the varieties overlap, and they had also apparently collected at that time an intermediate that was recognized by Torrey and Gray as "fere β ". Certainly many specimens now justify considering variations from the type as a second variety.

In numerous specimens examined, wherever the subterranean stem is present, it is a long, often divided rootstock. Though not preserved on the specimens of Drummond and Douglas and therefore not mentioned by Hooker, it is quite characteristic of *L. punctata* from western Canada and southward, whether variety *typica* or *nebraskana*. This we believe helps to distinguish the species from the more southern ones with which it has been confused, namely *L. mucronata* and *L. angustifolia*, for they have somewhat globular corms.

In the prairie provinces of Canada specimens are readily identified as var. *typica* as they agree well with the type specimens of Hooker who described the phyllaries "margine ciliato, lanatis mucronato-acuminatis". Specimens from near the south end of the mountain range, as in Colorado and New Mexico, have very frequently phyllaries that are markedly mucronate and might, from observation of this character alone, suggest relationship to *L. mucronata*. However, some of them have leaves 2-4 mm. wide, with ciliate margin, and an elongate ramifying rootstock, belong to *L. punctata* and are definitely var. *typica*. Others are more nearly like var. *typica* than var. *nebraskana*, but are distinctive in having mucronate and short-ciliate, colorful phyllaries. Since specimen for specimen seen, *punctata* var. *typica* from western Canada shows lanceolate-acuminate phyllaries and from Colorado and New Mexico more frequently these mucronate ones, we are calling these latter, *forma coloradensis*.

In the central plains-states of Nebraska, Kansas, and Oklahoma, the great majority of specimens seen are var. *nebraskana*. For example, only three specimens of var. *typica* have been seen from Nebraska, and in Kansas only from the counties on the western border along Colorado. The counties listed for specimens examined from this state are curiously enough classified as follows: 6 (of which 5 are from the western border) for var. *typica*,

9 (all from the central to the eastern part of the state) for var. *nebraskana*, and 5 (Riley, Graham, Ellis, Ellsworth, and Kiowa) rather central, for questionable intermediates. J. N. Rose and W. R. Fitch, crossing the state, seem to have collected on Sept. 14, 1912, in the vicinity of Syracuse, Hamilton Co. (US) (i. e. on the Colorado border), var. *typica* and on Sept. 23, 1912, in the vicinity of Pratt, Pratt Co. (US) (i. e. along the central southern border of the state) var. *nebraskana*, or an intermediate.

There are, however, many specimens which are not readily placed varietally. As frequently happens where the range of two species or varieties overlap, there are apparent intermediates. Thus in the states marginal to the range of each variety of *L. punctata* the number of doubtful specimens increases, and a list of these, A, is given below. Frequently it is difficult also to allocate specimens because they seem to be just intermediate between two species. From a region like Oklamona, where the range of *L. mucronata* overlaps that of *L. punctata*, and the plains variety *nebraskana* and forma *coloradensis* of var. *typica* of the latter species meet, come more specimens that are puzzling intermediates. Often specimens of the same collector's number and date in different herbaria will favor different interpretations. While it is impossible to make definite decisions when the rootstock is not present, as is often the case in herbarium specimens, still, though lacking the association of rounded or elongate rootstock with other recognized specific characters, there is evidence that this is a region of much hybridization. List A & B below give some of the intergradations.

A. Intermediates of *Liatris punctata* Hook var. *typica* & var. *nebraskana*. MICHIGAN. KALAMAZOO Co.: prairie roadside, $\frac{1}{2}$ mi. n. e. of Schoolcraft, Aug. 14, 1936, C. R. Hanes, 3646 (G); $\frac{1}{2}$ mi. n. e. of Schoolcraft, Aug. 7, 1937, C. R. Hanes, 3887 (NY); prairie along roadside, $\frac{1}{2}$ mi. n. e. of Schoolcraft, Aug. 1, 1938, C. R. Hanes, 308 (NY). MINNESOTA. CLAY Co.: Moorhead, Aug. 15, 1901, C. A. Ballard, 3154 (G). OTTER TAIL Co.: Battle Lake, Aug. 1892, E. P. Sheldon (G, US); dry hills and sandy soils, Fish Lake, Sept. 2, 1907, Z. L. Chandonnet (US). HENNEPIN Co.: Fort Snelling, Aug. 22, 1883, W. H. Manning (G), Sept. 21, 1890, E. A. Mearns, 140 (US). WABASHA Co.: Lake City, Aug. 29, 1883, W. H. Manning (G); Liberty, Aug. 29, 1883, W. H. Manning (G). IOWA. Co. undetermined: western Iowa, 1872, H. H. Babcock (US). EMMET Co.: prairies, Herb.

M. Bebb, *R. I. Cratty* (G). PALO ALTO Co.: gravelly prairie knoll, Lost Island Twsp., Sect. 20, Aug. 27, 1934, *Miss A. Hayden*, 10530 (G, NY); gravelly prairie in cemetery at Dickens, Aug. 4, 1934, *Miss A. Hayden*, 10528a (G). NORTH DAKOTA. BENSON Co.: Butte, Aug. 26, Sept. 29, 1907, *J. Lunell* (NY). STARK Co.: Dickinson, Sept. 18, 1908, *W. R. Holgate* (NY). MORTON Co.: Mandan, 1915, *J. T. Jarvis*, 160 (US). RICHLAND Co.: prairie, Hankinson, Aug. 25, 1902, *C. O. Rosendahl*, 1147 (NY). SOUTH DAKOTA. Without stated locality, probably DAY Co.: sandy, arid prairie heights, around the Sioux, upper St. Peter R., near Fort Pierre, dividing ridges between Missouri & Mississippi waters, 1839, *Nicollet's N. W. Exped.* "fere β " (G); Aug. 20, 1839, *Nicollet's N. W. Exped.* *C. A. Geyer*, 272 ("fere β T & G" (US)). MEADE Co.: Black Hills, near Fort Meade, Aug. 10, 1887, *W. J. Forwood* (US); Park, near mouth of Gimlet Creek, Aug. 4, 1910, *J. Murdock* (G, NY). FALL RIVER Co.: on prairie in canyon bottom, n. w. of Hot Springs, Aug. 6, 1941, *G. J. Goodman*, 3300 (G, NY). YANKTON Co.: on high unbroken prairies, Jamesville, Aug. 24, 1899, *L. A. Bruce* (US). NEBRASKA. KEYAPAH Co.: Carns, Aug. 24, 1893, *F. Clements*, 2902 (G, US). THOMAS Co.: on sandhills, Middle Loup R., near Thedford, Sept. 13, 1893, *P. A. Rydberg*, 1761 (G, P); near Plummer Ford, Dismal R., Aug. 22, 1893, *P. A. Rydberg*, 1761 (US). DEUEL Co.: without stated locality, Aug. 1890, *P. A. Rydberg*, 138 (NY). KEARNEY Co.: Minden, Sept. 5, 1920, *Dr. Hapeman* (G). KANSAS. RILEY Co.: Manhattan, Sept. 1, 1892, *S. Norton* (NY); Fort Riley, Sept. 1892, *E. E. Gayle*, 603 (NY). GRAHAM Co.: Bogue, Sept. 8, *R. H. Imler* (US). ELLIS Co.: rocky prairie soil, w. of Hays, June 20, 1927, *E. Bondy* (G, US, O). ELLSWORTH Co.: Kanapolis, Aug. 27, 1891, *E. O. Wootton* (US). IOWA Co.: Belvedere, Sept. 5, 1898, *M. White* (US).

B. Intermediates of *Liatris punctata* Hook & *Liatris mucronata* DC. KANSAS. McPHERSON Co.: McPherson, Sept. 5, 1890, *W. A. Kellerman* (US). OKLAHOMA. WOODS Co.: Alva, Oct. 1913, *G. W. Stevens*, 2866 (G); prairie, Alva, Sept. 28, 1913, *G. W. Stevens*, 2851 (G, NY, US, O); Augusta, Oct. 12, 1896, *U. S. Geol. Survey*, *L. F. Ward*, 51 (US). TULSA Co.: prairie, near Tulsa, Oct. 30, 1913, *G. W. Stevens*, 2982 (G). PAWNEE Co.: Pawnee, Aug. 30, 1895, *J. W. Blankinship* (G). OKLAHOMA Co.: near Oklahoma City, Sept. 16–17, 1938, *S. S. White*, 1156 (G). BECKHAM Co.: 6 mis. s. of Elk City, Oct. 17, 1936, *C. T. Eskeu*, 1505 (US). COMANCHE Co.: Fort Sill, Aug. 28, 1916, *Mrs. J. Clemens* (G); prairie, w. of Wichita National Forest, Oct. 10, 1936, *C. T. Eskeu*, 1429 (G, NY, US, O). HARMON Co.: bad lands, eroded sand-stone & gypsum desert, Oct. 24, 1936, *M. Hopkins*, 1055 (G, NY, O). TEXAS. HUTCHINSON Co.: 5.9 mis. n. of Borger, Sept. 29, 1936, *H. B. Parks & V. L. Cory*,

16338 (T). CLAY Co.: 13 mis. n. e. of Henrietta, Oct. 20, 1940, V. L. Cory, 40761 (G, US). LUBBOCK Co.: vicinity of Lubbock, E. L. Reed, 3162 (US); vicinity of Lubbock, E. L. Reed, 3178 (US). EL PASO Co.: Guadalupe Mts., Aug. 22, 1901, V. Bailey, 700 (US).

Allowing for the modification to mucronate phyllaries in southern *L. punctata* var. *typica* forma *coloradensis*, specimens from the mountains of New Mexico are predominantly *typica*. Of all the specimens I have seen from New Mexico, none show a markedly interrupted spike with long internodes between larger heads, although there is a suggestion of it in one collection by Miss C. C. Ellis, no. 284, from the Sandia mountains (NY, US). This character is noticeable in specimens from the Guadalupe and Davis mountains of the Trans-Pecos region of western Texas where slightly varying plants of *L. punctata* are of tall habit with lax spike of fewer distant heads and with fewer leaves. Gray (Pl. Wright. 83 (1852)) refers to one of Wright's specimens as follows: "no. 246 *Liatris punctata* Hook . . . This is one of the narrower-leaved forms with the scales of the involucre very obtuse and abruptly mucronate. *L. mucronata* DC. (founded on Berlandier's no. 1926) is a similar but more depauperate state of the same species." Examination of this collection, from Pass of the Limpia, Jeff Davis Co., Texas (G), shows one rather better specimen to have about 25 heads distributed over 30 cm. giving quite an interrupted spike. From the Chisos mountains of Brewster county and the adjoining northwestern region of Coahuila, Mexico, come specimens with interrupted spike and broader, almost glabrous leaves and an obese, oval rootstock. Until further collections have been made we group these specimens from the southernmost mountain localities as *L. punctata*, var. *mexicana*.

Not to be confused with these, however, though also showing loose interrupted spikes, are plants from the more eastern plains of Mexico, in Tamaulipas, and northeastern Coahuila. These are tall, more slender plants with narrow leaves and mucronate phyllaries and shorter corolla-tubes and pappus that associate them with *L. mucronata*, as it is seen from Frio, San Patricio and Duval counties of the Rio Grande plains of Texas. The rootstock is generally globular as seen in typical *L. mucronata* DC. but may be ovoid, suggesting that there may here too be intermediates be-

tween the two species reaching their southern limit of range. We have placed this material as *L. mucronata* var. *interrupta*.

L. punctata has established as good a foothold, if not a better one, in the northern and mountainous latitudes as *L. ligulistylis*, the only other species in Western Canada. Then, abounding along the eastern Rockies, it occurs southward in New Mexico, El Paso, Jeff Davis and Brewster counties, Texas, at a height of 5000 feet or more and "peters out" in northern Mexico in the varietal form (var. *mexicana*). What Kearney and Peebles state in Arizona Flowering Plants and Ferns (1942, p. 9) would perhaps be expected of *Liatris punctata*: "Many species of this category [i. e. of Rocky Mt. distribution] range from the Canadian Rockies to the Sierra Madre in northern Mexico. . . . The higher mountains of Arizona and the elevated plateaus in the northern parts of the state offer congenial habitats for the characteristic plants of this category". Yet strangely no collections of this or any other species of *Liatris* from the state of Arizona have been found in any herbaria examined. *Liatris punctata*, though not crossing the Rockies, made a very successful encroachment on their eastern slopes.

Liatris cylindrica Torr. (Ann. N. Y. Lyceum ii. 210 (1827)) obviously equals *Liatris cylindracea* Michx. as to name (as shown by reference to Flor. Bor. Amer. and to the correct page of it) but not as to plant. The specimen of Dr. James, of Long's 1st Expedition (NY), to which Torrey referred, proves to be *L. punctata* var. *typica*, but is without locality of collection. Its source then is doubtful; in the list it is given as "sources of the Platte?". This would be too far west for *L. cylindracea*. Torrey made the observation "Dr. James' specimen resembles those collected by Captain Douglas in Cass' expedition except in not being above ten inches high with the leaves hairy on the margin"; that collection Torrey (Am. Jour. Sci. & Arts iv. 66 (1822)) referred to *L. squarrosa*. This should, however, not prove too confusing since Captain Douglas' material came from the west shore of Lake Michigan and may very well have been *L. cylindracea*. Elliott, indeed (Sk. ii. 276 (1824)), refers to specimens of that species from that locality received from Torrey. It therefore seems clear that Torrey intended to call the James specimen *L. cylindracea*, but the locality given in the text is unlikely for that species

and it does suit *L. punctata*, which the specimen actually is. Gray, Synop. Fl. i². 110 (1884), also makes *L. cylindrica* Torr. synonymous with *L. punctata*.

That *L. punctata* crosses with species of other series, as of the *Scariosae*, is seen in \times *L. Weaveri* Shinnery (see no. 18) and in the following hybrid.

\times *LIATRIS FALLACIOR* (Lunell) Rydb. emend. Shinnery. Stems single from an elongate (over 5 cm. long), horizontal rootstock, 3.5–6 dm. tall, mostly green with scattered pubescence basally, which becomes more dense above, of long white appressed hairs; leaves linear, also softly pubescent with margins asperous due to short cilia about as in *L. ligulistylis*; basal leaves 8 cm. long and 3 mm. wide, gradually narrowing to become bracts subtending the heads: inflorescence an irregular spike, 8–20 cm. long, or in slender specimens reduced to but a few (2–5) heads with the terminal one in all specimens markedly larger than the axillary ones (usually 2–3 times, but in one specimen, that of Lunell no. 1016, 4–5 times as large): heads generally 14–18-flowered, and slightly turbinate, ca. 1.5 cm. wide and high, at the time of flowering; phyllaries narrow, oblong and obtuse, mostly green with narrow colorful petaloid margins fringed with distinct cilia (in the cotype there is slight evidence of a somewhat acute cusp disappearing behind the blunt tip); corolla 8–9 mm. long, moderately pilose within; achene ca. 5 mm. long; pappus 7–8 mm. long and plumose though less conspicuously so than *L. punctata*.—Fl. Prairies and Plains, 780 (1932); Shinnery, Amer. Midl. Nat. xxix. 40 (1943). *Laciniaria fallacior* Lunell, Amer. Midl. Nat. v. 38 (1917). *Laciniaria fallacior* var. *celosioides* Lunell, l. c.—NORTH DAKOTA. BENSON Co.: on sunny, dry prairie, Leeds, Sept. 15, 1916, Lunell, 1015 (TYPE of *Laciniaria fallacior*), 1016 (TYPE of *Laciniaria fallacior* var. *celosioides*).

Known only from the type (2 plants on sheet) and cotype (3 plants on sheet) of Lunell's collection in North Dakota. These few specimens clearly show an intermediacy between *Liatris punctata* and *L. ligulistylis*. In the elongate, horizontal rootstock, narrow linear leaves, general spike-like inflorescence, the narrow-oblong shape of the phyllaries and the plumose (though not markedly so) pappus they resemble the former parent. In contrast the general pubescence of leaves and stem (especially that of the inflorescence-rachis), the large terminal heads and their development almost to the exclusion of others in several specimens, the obtuse tip and the slightly petaloid margin of the phyllaries and the length of the achene and pappus are more

similar to *L. ligulistylis*. The complete effect is that of a very marked blending of the characters of two species, belonging in the two sections *Suprago* and *Euliatris*, with barbellate and plumose pappus respectively and this is interestingly enough seen in an intermediacy in the extent of plumosity in the resultant hybrid.

The type specimen of Lunell's var. *celosioides* differs in no way except that it shows an unusually large congested terminal head, a result of some fasciation.

25. *LIATRIS densispicata* (Bush), comb. nov. Stems many, slender, glabrous, 3–6 dm. high, from an elongate rootstock that runs horizontally in the sand, giving off clusters of aerial stems; leaves numerous, punctate, glabrous, narrowly linear, soft and ascending, 5–10 cm. long, 1–2 mm. wide, gradually shortening to the bracts of the flowering spike: inflorescence 10–30 cm. long, usually of densely crowded, sessile, narrow cylindrical heads of 3–8 flowers and 8–12 mm. long; phyllaries herbaceous, oblong-lanceolate, acute- or acuminate-tipped, without or with a few marginal cilia; flowers purple, corolla 10–11 mm. long, tube pilose within; pappus 9 mm. long, plumose; achenes 8 mm. long.—*Lacinaria densispicata* Bush, Amer. Mid. Nat. xii. 313 (1931). *Lacinaria arenicola* Bush, Amer. Mid. Nat. xii. 314 (1931).

Type from Bunker prairie, Anoka Co., Minnesota. Known only from that state.—**ANOKA Co.:** sand-dunes, Bunker Prairie, Aug. 26, 1927, C. O. Rosendahl, 5421b (M, TYPE), 5420 (M, type of *Lacinaria arenicola*). **HENNEPIN Co.:** Minneapolis, Aug., 1868, W. M. Canby, 541, 542 (US), Sept. 15, 1891, J. H. Sandberg, 933 (US).

This species seems distinct from *L. punctata*, var. *typica* and var. *nebraskana*, which are found in Minnesota, by the generally finer and more slender structure of stem, spike and leaves. In these characters it recalls *L. angustifolia*, which is mostly confined to Texas, though rarely collected in southern Missouri, Nebraska and Kansas. Its long, horizontal rhizome, however, indicates that the Minnesota locale is not just an isolated northern station of the latter species.

Lacinaria arenicola Bush, described from plants from the same type region, collected also by C. O. Rosendahl, seems indistinguishable in any marked character and represents probably a less vigorous and poorly nourished plant in which some heads have not developed, thus giving the irregular spike shown in the type sheet. Dr. Rosendahl, who also collected plants for the writer from the same region, was unable to make any distinctions.

26. *LIATRIS MUCRONATA* DC. Corm round, about 2-4 cm. in diameter, bearing a number of stems, mostly glabrous, rarely hirsute, 3-7 dm. in height, often reddish in color, with numerous narrowly linear, punctate leaves, mostly without marginal cilia (occasionally hirsute when accompanying a hirsute stem); basal leaves 5-8 cm. long and 1.5-5 mm. wide, diminishing upwards to short bracts often exceeding the heads of the lower portion of the spike-like inflorescence of usually crowded, sometimes scattered, heads, 8-30 cm. long; heads cylindrical, 1.2-1.8 cm. long (measured to the end of the pappus), of 4-6 flowers; phyllaries herbaceous, outermost ones short, ovate-lanceolate with mucronate tips, becoming longer inwards, the innermost 9-11 mm. long by 2-3 mm. wide, oblong, with midvein prominent, abruptly mucronate to cuspidate and with margin finely ciliolate or but membranaceous; corolla purple, 9-10 mm. in length, only moderately pilose in the base of the tube; filaments sometimes pilose; pappus 6-7 mm. long, plumose; achene 5.5-7 mm. long, ribbed and hairy.—Prodr. v. 129 (1836).

Var. *typica*. Inflorescence a dense spike of closely crowded heads 1.2-1.5 cm. long; more general throughout the species-range. *L. mucronata* DC. Prodr. v. 129 (1836) sens. strict.; Engelm. & Gray, Pl. Lindh. i. 10 (1845); Torr. & Gray, Fl. N. Amer. ii. 69 (1841); not sensu Gray, Plant. Wright. 83 (1852). *Liatis acidota* var. *mucronata* Gray, Synop. Fl. i². 110 (1884). Probably *Lacinaria leptostachya* Bush, Amer. Mid. Nat. xii. 314 (1931).

Chiefly in Texas, from the eastern hardwood forest region westward through the Edwards plateau, with a few stations scattered northward through the plains region of Texas into Oklahoma, Kansas and Missouri.—MISSOURI. ATCHISON Co.: dry ground, Oct. 1, 1893, *B. F. Bush*, 198 (G, US). BARRY Co.: Eagle Rock, June 22, 1897, *B. F. Bush*, 118 (US). KANSAS. SEWARD Co.: vicinity of Liberal, Sept. 23, 1912, *J. N. Rose & W. R. Fitch*, 17149 (2 stems) (NY). OKLAHOMA. KINGFISHER Co.: Huntsville, Sept. 20, 1895, *Miss L. A. Blankinship* (G). OKLAHOMA Co.: sandy clay on sandstone hillside, 2½ mi. w., ½ mi. n. of Spencer, Aug. 6, 1939, *U. T. Waterfall*, 1552 (G). BECKHAM Co.: prairie, Cedar Twsp., Oct. 18, 1936, *C. T. Eskew*, 1509 (US, O). TEXAS. Co. undetermined: rocky prairies, Colorado to Guadalupe, July, 1845, *Lindheimer* (G). POTTER Co.: Templin, 1927, *V. L. Cory*, 2521 (G). HARDEMAN Co.: abundant on prairies, Chillicothe, Sept. 27, 1906, *C. R. Ball*, 1151 (NY, US). BAILEY Co.: grassy hillsides, 2 mis. s. of Muleshoe, Aug. 24, 1921, *R. S. Ferris & C. D. Duncan*, 3428 (NY). GRAYSON Co.: Denison, Oct. 15, 1932, *Savage* (NY); Bonham to Sherman, Aug. 28, 1939, *B. C. Tharp* (G). DENTON Co.: prairie on Houston clay, between Denton &

Aubrey, Oct. 6, 1937, *W. L. McCart*, 674 (US). KAUFMAN Co.: vicinity of Terrell, May 8, 1904, *F. J. Tyler* (US). DALLAS Co.: Dallas, Aug. 15, 1875, *J. Reverchon* (G); dry soil, Dallas, Sept. 1877, *J. Reverchon* (NY); rocky bluffs, Dallas, Aug.-Sept. *J. Reverchon*, *ex Herb. Curtiss*, 1180 (G, NY); Dallas, 1875, *J. Reverchon*, 15 (US); Dallas, Sept. 26, 1900, *B. F. Bush*, 1112 (G). TARRANT Co.: without stated locality, Oct. 10, 1925, *A. Ruth*, 78 (NY). PARKER Co.: Weatherford, Oct. 18, 1902, *S. M. Tracy*, 8143¹ (US). HOOD Co.: dry calcareous soil, Comanche Park, Sept. 15, 1914, *E. J. Palmer*, 6541 (US). CALLAHAN Co.: rocky open ground, Baird, Sept. 30, 1918, *E. J. Palmer*, 14555 (US). ANDERSON Co.: alt. 300', Sept. 20, 1937, *G. L. Fisher*, 37168 (US). BROWN Co.: Brownwood, Oct. 23, 1916, *E. J. Palmer*, 11106 (US). LAMPASAS Co.: 8 mi. n. w. of Lampasas, Sept. 23, 1935, *H. B. Parks & V. L. Cory*, 15692 (T). REAGAN Co.: 11 mi. n. w. of Stiles, Nov. 18, 1942, *V. L. Cory*, 40954 (G). WILLIAMSON Co.: Georgetown, Aug. 1929, *M. D. Cody* (F). LLANO Co.: Enchanted Rock, Oct. 12, 1930, *Miss E. Whitehouse* (G). TRAVIS Co.: dry calcareous soil, open ground, Austin, Sept. 21, 1916, *E. J. Palmer*, 10766 (US); Austin, Sept. 11, 1877, *L. F. Ward* (US); near Austin, Oct. 11, 1940, *R. R. Innes*, 105 (G). BLANCO Co.: 6¼ mi. n. of Blanco, Sept. 23, 1935, *V. L. Cory*, 15691 (G). SUTTON Co.: Roy Hudspeth's, Sept. 3, 1938, *V. L. Cory*, 2520 (G); Schoolhouse Hill, Sonora, Sept. 12, 1942 (no. 40175), Oct. 27, 1942 (no. 40828) *V. L. Cory* (G). AUSTIN Co.: San Felipe (Austin) Jan. 1835, *T. Drummond*, 122 (G, NY). HAYS Co.: San Marcos & vicinity, 1898, *S. W. Stanfield* (NY). KERR Co.: Kerrville, Oct. 4, 1916, *E. J. Palmer*, 10896 (US). Comancheries (KERR & KENDALL Co. probably) from Boerne to Comfort, Nov.-Dec. 1828, *Berlandier*, 1926 (G, isotype). Ex prov. Mex. 1839, *ex Herb. Musei Britannici* (US). COMAL Co.: Comanche Spring, New Braunfels, Sept., 1849, *Lindheimer* 940 (G, NY, US, P), Sept., 1850, 941 (G, NY, US, P, O), 1849-53, 942 (G, NY, US), Sept., 1850, 943 (G, NY, US, O). BEXAR Co.: 3 mi. southwest of Smithson Valley, Sept. 23, 1935, *H. B. Parks & V. L. Cory*, 15687 (T); vicinity of San Antonio, Oct. 19, 1912, *J. N. Rose*, 18016 (US), Sept. 3, 1921, *Miss E. D. Schultz*, 610 (US), *G. Jeremy*, 39 (G), Aug., 1937, *Sister Mary C. Metz*, 3030 (NY).

Var. *interrupta*, var. nov., a varietate typica differt spicis interruptis, capitibus 1-3 cm. inter se distantibus 1.5-1.8 cm. longis.—TYPE from south of Mathis, San Patricio Co., Texas, Oct. 20, 1927, *J. N. Rose & P. G. Russell*, 24156 (G).

Tamaulipas, San Luis Potosí, and northeastern Coahuila, Mexico, and some of the bordering counties of Texas.—TEXAS.

¹ The specimens at G, NY & T. might be considered intermediates between *mucronata* and *angustifolia*.

Without stated locality: *Drummond* (G). OLDHAM Co.: Bravo, Oct. 7, 1909, *C. R. Ball*, 1593 (US). RANDALL Co.: Palo Duro Canyon, Sept. 2, 1907, *C. R. Ball*, 1217 (NY, US). BEXAR Co.: San Antonio, Sept. 3, 1921, *Miss E. D. Shultz*, 610 (US). UVALDE Co.: Uvalde to Hondo, Oct. 10, 1936, *B. C. Tharp* (G). FRIO Co.: 14 mis. s. of Pearsall, Sept. 18, 1939, *F. Shreve*, 9442 (G). SAN PATRICIO Co.: s. of Mathis, Oct. 20, 1927, *J. N. Rose & R. G. Russell*, 24156 (G, type, NY, US). DUVAL Co.: San Diego, 1884-1888, *Miss B. Croft*, 21 (NY, US). MEXICO. COAHUILA: Sierra de Santa Rosa, s. of Musquiz, July 13, 1938, *E. G. Marsh*, 1290 (G); Palm Canyon, Musquiz, Sept. 19, 1936, *E. G. Marsh*, 965 (G); Del Carmen Mts., Sept. 7, 1936, *E. G. Marsh*, 792 (G); Rancho Agua Dulce, Musquiz, July 1, 1936, *F. L. Wynd & C. H. Mueller*, 399 (G, US). TAMAULIPAS: sierra near San Lucas, Jaumave, July, 1932, *H. W. Von Rozynski*, 520 (3 stems to right) (NY).

Liatris mucronata has been passing as *Liatris punctata* or, as explained (see no. 4), has been erroneously appended to *Liatris acidota* as a variety. The differences between *L. mucronata* and *L. acidota* have already been noted under the latter species.

The type of *L. mucronata* was collected Nov.-Dec. 1828, by Berlandier, no. 1926, from the Comancheries orientales, Texas (Geneva) while that of *L. punctata* (Kew) was collected on the plains of Saskatchewan. Though the type plant in Geneva has not been seen, a photograph of it and an isotype in the Gray Herbarium have been compared. In neither is there any rootstock present. Engelm. & Gray (Pl. Lindh. i. 10 (1845)) clearly recognized the species, when describing the new species *L. acidota*, and referred to Lindheimer's collections of both species. They included in the description of *L. mucronata* "caudice globoso." Other specimens collected from Texas, similar in other characters to *L. mucronata*, show that a globose or rounded corm is characteristic of this species in contrast to the elongate and often branched rootstock of *L. punctata*. The two species in their type regions differ also in the nature of the phyllaries which are abruptly mucronate and cuspidate in this species, rather than lanceolate-acuminate as in *L. punctata* from the western Canadian provinces. *L. mucronata* has also a shorter pappus, a character in which, as in the globular rootstock, it shows resemblance to *L. angustifolia*.

However, variations occurring in *L. punctata* over its great north-south range, undoubtedly help to explain some of the con-

fusion of these two species. As stated under *L. punctata* (see no. 24), mucronate phyllaries, rather than long lanceolate-acuminate ones are common in f. *coloradensis* from the southern end of the range in Colorado and New Mexico. In the regions between these states and Texas, there are plenty of specimens giving evidence of a blending of the characters of *L. punctata* and *L. mucronata*. Thus from the northern plains of Texas, from Oklahoma, Nebraska and Kansas come perplexing specimens which may represent intermediates between the two. Certainly when lacking rootstocks, as frequently happens, specimens are difficult to determine. So far, in southern Texas from the eastern border through the counties of the hardwood forest, blackland prairie, Edwards plateau and Rio Grande Valley, where *L. mucronata* abounds, no specimens with a long ramifying rootstock have been seen. From the northern plains of Texas, only one specimen has been seen, *H. B. Parks* and *V. L. Cory* from 5.9 mi. n. of Borger, Hutchison Co. (which is close to the Oklahoma border), Sept. 29, 1935, no. 16338 (T), which has an elongated rootstock along with mucronate phyllaries that suggest *L. punctata* f. *coloradensis*. For other specimens, as in the list of intermediates, it has been less easy to make specific determinations.

As quoted, in the discussion of *L. punctata*, Gray compared what was probably the only specimen he had from the El Paso region of Texas (Chas. Wright's no. 246 (G)) with *L. mucronata* because of its obtuse and abruptly mucronate bracts. No rootstock is present on the specimen. Yet it shows few heads separated by long internodes, in contrast to the quite dense spike-like arrangement in the type of *L. mucronata*, which Gray considered a "more depauperate state" of *L. punctata*. Gray's opinion may have contributed further to the uncertainty of the determination of this species. Sufficient specimens have now been seen to refute the idea that *L. mucronata* DC. is just a depauperate form of *L. punctata*. Also such an interrupted spike as is seen in Wright's specimen of *L. punctata* is found in the most southern phase of *L. punctata*—var. *mexicana*.

A plant that has so far been collected very rarely from the coastal plain region of Texas, with few large heads of 8-10 flowers, often singly disposed along stems that may branch, and having longer achenes and pappus, seems a greater variant, and is here given specific rank as *L. bracteata*.

L. mucronata is to be distinguished from *L. angustifolia*, which occurs with it through Texas and casually resembles it, by the smaller heads with glabrous bracts and the softer smooth leaves, though here again there may be found intermediates, e. g., *S. M. Tracy*, No. 8143 from Weatherford, Parker Co., Texas, Oct. 18, 1902 (NY and T) (see discussion under *L. angustifolia*).

27. *LIATRIS angustifolia* (Bush), comb. nov. Stems slender, glabrous, 6–8 dm. high, often reddish in color, from a globose corm usually 2–4 cm. in diameter: leaves narrowly linear, soft, epunctate or hardly at all punctate; basal ones 5–10 cm. long, 1–3 mm. wide, reduced progressively in length below a short spike to short bracts subtending the heads, but in longer spikes only so shortened throughout its length: inflorescence slender, 20–60 cm. long, of densely crowded heads, 8–16 mm. long, sessile or rarely becoming pedunculate, as following injury: heads slender, cylindrical, 3–6-flowered, ca. 1.5 cm. in length; phyllaries lanceolate, outer ones broader, inner ones narrower, acuminate, thin-papery, glabrous with merely membranous or slightly ciliate margins in exceptional cases, somewhat glutinous; flowers purple, corolla 9–10 mm. long, slightly pilose within on the tube and noticeably so on the filaments of the stamens; pappus ca. 7 mm. long with lateral cilia more than fifteen times the diameter of the seta though not long-plumose; achenes 5–7 mm. long.—*Lacinaria angustifolia* Bush, Amer. Mid. Nat. xii. 315 (1931).

From the inner margin of the coastal plain region of Texas, northward and westward through the plains region into Oklahoma and occasionally Kansas, Nebraska, Arkansas and Missouri.—MISSOURI. BARRY Co.: rocky slopes, bald knobs, along Mo.-Ark. line, Eagle Rock, July 27, 1926, *E. J. Palmer*, 31455 (G). NEBRASKA. DAWES Co.: Crawford, Aug. 13, 1896, *E. N. Plank* (NY). CASS Co.: prairies, Weeping Water, 1888, *T. A. Williams* (US). KANSAS. RILEY Co.: Manhattan, Aug. 30, 1892, *S. Norton* (NY). MIAMI Co.: Paola, Aug. 1883, Aug. 1885, *Dr. Oyster*, 3503 (NY). SUMNER Co.: high prairies, Caldwell, Sept. 10, 1890, *B. B. Smyth*, 279 (NY, US). OKLAHOMA. CREEK Co.: along rwy. w. of Sapulpa, Sept. 6, 1913, *F. W. Pennell*, 5378 (NY). CLEVELAND Co.: 10 mi. e. of Norman, Aug. 20, 1903, *A. H. Van Fleet* (US); Denver, Little River, Aug. 21, 1903, *A. H. Van Fleet* (O). PITTSBURG Co.: meadow, Sept. 22, 1934, *J. E. McClary* (O). MURRAY Co.: Platt National Park, *G. M. Merrill & W. A. Hagan*, July 16, 1935, 924 (NY, US, O); Sept. 30, 1935, 1535 (NY, O); near Sulphur, Aug. 5, 1939, *H. Broadbent* (O). CHOCTAW Co.: prairies, Fort Towson (Arkansas. *Dr. Leavenworth*) (G, NY).

TEXAS. FANNIN Co.: (plant to right), Bonham, Sept. 21, 1877, *L. F. Ward* (US). GRAYSON Co.: Denison, Sept. 13, 1906, *F. J. Tyler* (US). TARRANT Co.: dry soil, Fort Worth, Sept. 5, 1912, *A. Ruth*, 78 (M, 211347 type); rocky lands, Fort Worth, July 30, 1909, *A. Ruth*, 78 (US); without stated locality, Sept. 1898, *A. Ruth*, 78 (US). DALLAS Co.: hills, Dallas, Sept. 26, 1900, *B. F. Bush*, 1112 (NY, US); vicinity of Dallas, June 20, 1929, *Miss M. R. Stephenson*, 129 (US); rocky bluffs, Dallas, 1880, *J. Reverchon* (US). KAUFMAN Co.: Preston Bend, Sept. 16, 1906, *F. L. Tyler* (US). SOMERVELL Co.: Paluxy valley, 6 mis. above Glen Rose, Oct. 11, 1891, *L. F. Ward* (US). CORYELL Co.: rocky hillside, near Elige, Aug. 14, 1931, *S. E. Wolff*, 3269 (US). SAN AUGUSTINE Co.: San Augustine, *G. L. Crockett* (US). BLANCO Co.: 10 mis. s. of Blanco, Sept. 23, 1935, *V. L. Cory*, 15683 (G). GILLESPIE Co.: Half Moon, *G. Jermy*, 806 (US). HARRIS Co.: Houston, Nov. 2, 1913, *G. L. Fisher*, 501 (US). KENDALL Co.: Spanish Pass, Aug. 26, 1936, *V. L. Cory*, 19382 (G); 6 mis. n. w. of Boerne, Sept. 22, 1936, *V. L. Cory*, 20703 (G). COMAL Co.: New Braunfels, July 1846, *F. Lindheimer* (US).

This species can be distinguished from *L. acidota* (with long basal leaves, looser, narrower spike lacking noticeable subtending bracts because of the abrupt reduction of the leaves basally to setaceous bracts leaving a strict almost naked stalk) by its spike of densely crowded heads with bracts progressively shortened from the uppermost of a gradually diminishing series of leaves. Also, the range of *L. acidota* is limited to the coastal plains region of Texas, whereas this species occurs back of the coastal plain. As Bush states of *Lacinaria angustifolia*, "This is the species, I have no doubt, that has been the basis of Missouri, Kansas, Oklahoma and Arkansas being cited as part of the range of *L. acidota*."

Bush described *Lacinaria angustifolia* as having "involucral bracts ovate-lanceolate, pointed or cuspidate, densely pubescent on the backs, ciliate on the margins, not punctate". Examination of the type specimen (no. 211347 Minn.) from a cultivated individual, grown in the greenhouse from seeds of Texas plants, failed to show that the phyllaries are pubescent; but as they are lanceolate-acuminate and as the specimen otherwise compares well with the species here in mind, Bush's name has been taken up.

Among the citations given by Bush l. c. for this species is *A.*

Ruth, no. 78, Tarrant Co., Texas, Sept. 5, 1912 (Ruth Herbarium). A specimen of this collection at the Herbarium of the University of Minnesota, sheet no. 211348, is the given type of Bush's *Lacinaria Ruthii* (Amer. Mid. Nat. xii. 316-17 (1931)). The description of that species is not so very different from that of *angustifolia* though the involucre bracts are given as "oblong, cuspidate or pointed, slightly ciliate on the margins, glabrous". Examinations of the type specimen and duplicates thereof (G, NY) as well as other specimens seen from Texas (e. g. Oct. 25, 1917, A. Ruth, no. 736, from sandy woods, near Fort Worth, Tarrant Co. (NY), Oct. 18, 1902, S. M. Tracy, no. 8143 from Weatherford, Parke Co. (G, NY, T)) suggest an intermediate condition between *Liatrix mucronata* and *L. angustifolia*. The former covers much the same range as *L. angustifolia*. In the characters of spike, corolla, pappus and achene it also resembles it but the phyllaries have a prominent midrib that becomes a distinct cusp. Because the leaves of *L. angustifolia* are not distinctly punctate and are soft and pliable, they are usually distinguishable from those of equally narrow-leaved specimens of *L. mucronata*, which varies from a narrowly to a rather broadly (15 mm. wide) linear leaf and is occasionally hirsute. However, as the centre of range for both of these species lies in central Texas there are found confusing intermediates between them.

From *L. punctata* var. *nebraskana*, *L. angustifolia* is especially distinguishable by the rounded rather than elongate rootstock, the shorter corolla and pappus and the shorter lateral setae of the pappus making it seem short-plumose by comparison. The difference between the two is well shown on one sheet (NY) having a specimen with rootstock from Manhattan, Kansas, Aug. 30, 1892, S. Norton (NY), representing *L. angustifolia*, and a fasciated stem only (without rootstock) Sept. 1, 1892, representing *L. punctata* var. *nebraskana*. That the two intergrade seems quite possible. When examining a number of collections of B. F. Bush of different dates, from an isolated area like that of the mounds, Holt Co., Mo. (see list below) it seemed impossible to make definite determinations. Some, as no. 12026, and no. 12356, with their narrow leaves and reddish stems, resemble *L. angustifolia*, while others, as no. 12006 and no. 12009, are more like *L. punctata* var. *nebraskana*. Thus it seems possible that in this zone intergradations had occurred and had been successfully propagating.

Probable intermediates between *L. punctata* Hook. var. *nebraskana* and *L. angustifolia* Bush.—MISSOURI. HOLT Co.: on the mounds, Watson, Sept. 3, 1920, *B. F. Bush*, 9185, 9185a (NY), Sept. 30, 1930, *Bush*, 12006, 12009 (NY); high mounds, Mound City, Oct. 14, 1930, *Bush*, 12026, 12035 (NY), Sept. 29, 1931, *Bush*, 12356 (NY). OKLAHOMA. CHOCTAW Co.: limestone prairies near Hugo, Oct. 6, 1923, *E. J. Palmer*, 24046 (G).

28. *LIATRIS bracteata*, sp. nov., herba pauci- vel multiramosa, laesa vel culta ramosior; caulibus glabris e cormo subgloboso ca. 4 cm. diametro; foliis linearibus glabris punctatis rigidis leviter canaliculatis, basalibus 7–12 cm. longis 2–3 mm. latis demum rigidis, superioribus ad bracteas subinde capitula superantes reductis; spica laxissima; capitulis paucis magnis plerumque 8–10-floris subturbinatis 2 cm. longis summo pappo 1.5 cm. latis inter se 1–3 cm. distantibus, vel saepe capitulo solo terminali 10–14-flore; phyllariis exterioribus ovato-acuminatis, interioribus late lanceolatis plerumque cuspidatis 10–12 mm. longis 3–4 mm. latis saepe purpurascentibus marginibusque longe ciliatis; corollis purpureis 9–11 mm. longis, tubo intus sparse piloso; pappo 10–15 mm. longo plumoso; achaeniis 8–12 mm. longis.—Known only from Texas.—HARRIS Co.: 15 mi. north of Houston, along Hwy. no. 290, Oct. 1936, *R. G. Reeves* (G, TYPE). TEXAS. Without stated locality: 1857, *Leybold*, ex *Mus. Bot. Berol.* (US, 616780); *C. Wright* (G). HARRIS Co.: without stated locality, Sept. 1850¹, *G. Thurber* (G); ca. 14 mis. n. of Houston, along Hwy. no. 290, Aug. 29, 1936, *R. G. Reeves*, *L. O. Gaiser* & *P. Snure*, 48 (G); road from Cypress to Houston, Oct. 11, 1897, *F. W. Thurow*, 1 (US); Houston, 1842, *F. Lindheimer* (G); vicinity of Houston, Oct. 28, 1913, *J. N. Rose*, 18130 (US); Houston, Oct. 9, 1918, *G. L. Fisher*, 193 (US). GALVESTON Co.: without stated locality, Sept. 12, 1941, *Mrs. A. F. Nelson* (G). MATAGORDA Co.: north edge of town of Gulf, Oct. 10, 1934, *V. L. Cory*, 11566 (G); altitude 20', Matagorda, Oct. 14, 1936, *G. L. Fisher*, 3682 (US).

Plants of the same population as the type had been seen and collected before the time of flowering, on Aug. 29, 1936, by the writer, along with Dr. R. G. Reeves who had seen it growing along Highway no. 290 for several years. Reports for November, 1943, are that the stand has been temporarily destroyed by fire but it is hoped that the sturdy underground rootstock may still have survived.

The species has seemingly been rarely collected. It is closely

¹ Plant. Nov. Thurb. Gray (1855) begins only with an account of collections made in Oct.–Nov. 1850, and we are therefore unable to give the exact locality for this specimen, dated Sept. 1850, but it is probably from between Houston and Austin.

matched by a specimen of V. L. Cory from the vicinity of Gulf, Matagorda Co., Texas (G), which he described under another name in an unpublished note seen at the Gray Herbarium, in which he called attention to the terminal heads. Because the heads are not merely terminal and axial ones do occur and develop, even though separated by long internodes, the name *bracteata* is here being used.

The species most closely resembles *L. mucronata* var. *interrupta* in having few heads distributed in a lax spike but is distinctive in having heads of more and larger flowers, longer achenes and pappus (which is also long-plumose) than are found in that species. Cytological evidence too has borne out the need of considering it a new species.

SUMMARY OF THE PUNCTATAE

It seems to the writer that plants of the *Punctatae* series, which undoubtedly spread westward and northward from some center, as Texas, had their origin in a species with a rounded corm, such as is common to most of the genus. *L. mucronata*, abundant throughout most of Texas, and represented in the Rio Grande plains and a little southward in Mexico by a variety showing a lax and elongated inflorescence, could have been such a species. However there also occurs quite abundantly in Texas *L. angustifolia*, having soft fine leaves and acuminate rather than mucronate bracts. An ancestral form of either species might have given rise to *L. punctata*.

Plants spreading westward, on reaching the extreme southwestern region of Texas and the interior of New Mexico, where the mountains make a foothold more difficult, seem to have developed elongate ramifying rootstocks. This characteristic, evident in *L. punctata* of the Trans-Pecos region, was apparently successful enough for the species to have followed along the mountains northward, even to the Canadian prairies. In harmony with the suggestion of such migration is the observation that, in going northward, one finds a change from the predominantly mucronate phyllaries in specimens from the southern mountains to generally lanceolate ones in specimens from Canada. Or the development of a branching and spreading rootstock might have come along with a direct northward extension

from the warmer central region of Texas of such an *angustifolia*-like form.

There are no sharp lines of demarcation between any two species except the marked characteristic of two types of rootstock. There is a general appearance common to the three species of broader and the two of more localized range which makes them, as a group, distinguishable from all other species, though it has often brought them all under the common name of *L. punctata*. *L. acidota*, when recognized, cannot be grouped with this alliance though it was wrongly associated with members of it, perhaps because some do show a rounded rootstock.

SERIES IX. CYLINDRACEAE. Plants of intermediate height, 3–9 dm. tall, from loosely cymose, branched and bushy to single-stalked; heads few, 15–60-flowered, cylindrical to turbinate, approaching 2 cm. in height and 1–2 cm. in diameter; phyllaries herbaceous, appressed, obtuse to mucronate, sometimes spreading at the apices but never recurved; achenes 5–9 mm. long.—From southern Ontario westward to Minnesota and south to Missouri, with one species each in Florida and Texas.

- a. Inflorescences cymosely branched; corolla-lobes non-pilose within....b.
- b. Heads compact, cylindrical; phyllaries closely imbricated, the inner ones mucronate.....29. *L. cymosa*.
- b. Heads loose, turbinate to hemispheric; phyllaries loosely imbricated, the inner ones obtuse.....30. *L. Ohlingerae*.
- a. Inflorescence generally a short cymose raceme; corolla-lobes manifestly pilose within; heads compact, cylindrical; phyllaries closely appressed, obtuse to mucronate.....31. *L. cylindracea*.

29. *LIATRIS CYMOSA* (H. Ness) K. Sch. Corm rounded, up to 3 cm. in diameter; stems stiff, upright, 2.5–6 dm. tall, dichotomously cymosely branched above; leaves mostly glabrous, punctate, linear-lanceolate, the radical 15–20 cm. long and 5–15 mm. wide, tapering to a clasping petiole, the cauline linear, gradually reduced upwards; inflorescence finely pubescent and bearing heads in a distributed manner in either a simple or compound cyme; heads 2–2.5 cm. high and 7–10 mm. broad, of about 20 flowers; phyllaries appressed, closely imbricated, in about 6 series, slightly hirsute, ciliate-margined; the outer almost orbicular with rounded or truncate apices, the inner oblong with mucronate tips, often colored; flowers purple; corolla 15 mm. long, inner surface of lobes and tube smooth; pappus ca. 8–10 mm. long, plumose; achenes 8 mm. long, hispid on the ribs.—Just, Bot. Jahresb. xxvii. pt. i, 528 (1901). *Laciniaria cymosa* H. Ness, Bull. Torr. Bot. Club, xxvi. 21 (1899).

In Brazos and Washington counties, Texas.—Without locality, 1897, *A. M. Hildebrandt* (US). BRAZOS Co.: 1 mi. southeast of A. & M. College, Oct., 1896, *H. Ness* (NY, type); College Station, June, 1897, *R. H. Price*, 9 (US), 1935, *H. B. Parks*, 14538 (G), 14543 (T). WASHINGTON Co.: without locality, Aug. 15, 1938, *Miss E. Brackett* (G); *B. C. Tharp* (G).

Until seeing the two collections from Washington Co., Texas (G), which, as learned from Prof. B. C. Tharp, were collected twenty to thirty miles from the type-locality, I had known this species only from the one region where it was first discovered in 1896, by Dr. H. Ness, one mile south of the Agricultural and Mechanical College of Texas, growing on stiff clayey soil so poor that only a few species of grass dispute the ground with it. "Differing strikingly from other species in the scattered heads borne in a loose compound cyme", it nevertheless has heads of approximate size, flower-content and phyllaries that seem to relate it to *L. cylindricacea*. However, the inner surface of the corolla-lobes is glabrous rather than pilose as in that species. Thus we have again a parallel to the variation in the *Scariosae* series, where one species, *L. ligulistylis*, lacks the pilosity in the corolla-throat which other species of the series have.

30. *LIATRIS OHLINGERAE* (Blake) B. L. Robinson. Root elongate, tuberous, somewhat segmented or lobed, fleshy, 2.5–4.5 cm. long, and about 0.7 cm. in diameter; stems 1–3, 6–9 dm. high, simple, stiff and puberulous; leaves numerous, narrow, linear, punctate, glabrous and sessile, the basal up to 5 cm. long and 2 mm. wide, gradually diminishing upwards; heads several, on slender bracteolate pedicels 1–5 cm. long, or more numerous (8–18) in a cymose panicle, 2.5–3 cm. high and, when flowers are open, hemispherical though containing only about 25 flowers; phyllaries long, erect, loosely appressed and not greatly overlapping laterally; the outer suborbicular to obovate, the inner up to 2.5 cm. long, lanceolate, obtuse-tipped, all herbaceous with narrow scarious or ciliolate usually purplish margins; phyllaries drop away almost completely leaving an exposed honeycombed receptacle; flowers ca. 1.5–2 cm. long; corolla purple, without pilosity, with long, spreading, almost rotate lobes; pappus a little shorter than the corolla-tube, ca. 13 mm. long and plumose; achenes 7–9 mm. long.—Contrib. Gray Herb. civ. 49 (1934). *Lacinaria Ohlingerae* Blake, Bull. Torr. Bot. Club 1. 203 t. 9 (1923). *Ammopursus Ohlingerae* Small, Bull. Torr. Bot. Club, li. 393 (1924).

In Polk and Highlands counties, Florida.—POLK Co.: in scrub

formation, 9 mi. southeast of Frostproof, Nov. 1, 1922, *Mrs. F. E. Ohlinger* (G, US, TYPE); in white-sand scrub, Lake Clinch, Frostproof, Sept. 23, 1934, (G, US), Sept., 1936 (US). *Ohlinger*. HIGHLANDS Co.: sandhills near De Soto City, Aug. 31, 1922, *J. K. Small, J. W. Small & J. B. DeWinkeler*, 10681 (G, F); dry pineland, Lake Stearns, Nov. 4, 1927, *O. F. Burger & E. West* (F); scrub, Avon Park, Sept. 4, 1934, *J. K. Small & E. West* (F); scrub, Sebring, Sept. 5, 1934, *Small & West* (F); palmetto scrub, 8 mi. southeast of Childs, Aug. 15, 1945, *L. O. Gaiser, Mrs. E. H. Butts & Miss L. Arnold* (F).

The rare *Liatris Ohlingerae*, known from but few stations in the adjoining counties of Polk and Highlands, Florida, was considered by Small to constitute a new genus, *Ammopursus*. It is indeed a very distinctive species by reason of its somewhat segmented and lobed root, its very large heads with loose phyllaries that overlap laterally very little and long flowers having an almost rotate corolla and also by an exposed somewhat honeycombed receptacle after the phyllaries have dropped away. However, because of the similarity of the achenes, pappus and punctate leaves, as well as general flower-characters, it is here considered a species of the genus *Liatris*. As it seems to approach *L. cymosa* more closely than *L. scariosa* in leaves, size and number of flowers per head, as well as in lack of pilosity in the corolla-tube, it is placed next to it in the *Cylindraceae* series. Like *L. cymosa*, it has so far been found only in a very limited region.

31. *LIATRIS CYLINDRACEA* Michx. Stems one to several, 3–6 dm. high, mostly glabrous though sometimes scantily hirsutulous, from a rounded corm up to 3 cm. in diameter: leaves linear, rigid, punctate, mostly glossy, glabrous, sometimes ciliate at base or along margin and rarely with the lower or both surfaces covered with short white hairs; radical leaves often 20 cm. long, 4–5 mm. wide, the cauline few and shorter along a lax inflorescence of usually 5–20 elongate heads of 30–60 flowers (sometimes only a single terminal head develops but undeveloped buds in lower axils appear in such plants); involucre herbaceous, appressed, making the large heads, 2–3 cm. long, and 1–1.5 cm. in diameter, appear ovoid, before anthesis; phyllaries mostly glossy, rigid, ovate and rounded at summit with abrupt mucronate to acuminate tips, the outer sometimes spreading in older heads but never recurved or squarrose; corolla purple or rarely white, 12–14 mm. long, with the inner surface of the spreading lobes distinctly hairy; achene 5–6 mm. long; pappus 1 cm. long and plumose.—Fl. Bor.-Amer. ii. 93 (1803); Ell. Sk. ii. 275 (1822?); DC. Prodr.

30 (1836); Torr. & Gray Fl. N. Am. ii. 69 (1841), excl. syn. Willd.; Gray Synop. Fl. i². 109–110 (1884). *L. intermedia* Lindl. Bot. Reg. t. 948 (1825). *Liatris stricta* Macnab, Edinb. New Phil. Jour. xix. 60 (1835). *Liatris flexuosa* Thomas, Amer. Jour. Sci. xxvii. 338 (1839). *Liatris squarrosa* ♂ *intermedia* DC., Torr. & Gray Fl. N. Am. ii. 68 (1841); Gray Synop. Fl. i². 109 (1884). *Liatris squarrosa* sensu Torr. in Am. Jour. Sci. iv. 66 (1827), non (L.) Willd. *Laciniaria squarrosa* var. *intermedia* Mac Millan, Metasp. Minn. Valley, 506 (1892). *Liatris marginata* Cass. Dict. Sci. Nat. xxvi. 236 (1823). *Liatris monocephala* Cass. ibid. 237. *Laciniaria nervata* Greene, Pittonia iv. 317 (1901). *Liatris cylindracea* var. *solitaria* MacM. Bot. Gaz. xv. 333 (1890). *Laciniaria cylindracea* f. *solitaria* MacM. Metasp. Minn. Valley, 506 (1892). *Laciniaria cylindracea* var. *solitaria* Farwell, Rep. Mich. Acad. Sci. xvii. 171 (1916).

From southern Ontario and western New York westward to Minnesota and Missouri.—ONTARIO. MANITOULIN Co.: limy soil, La Cloche Peninsula, July 11, 1937, A. S. Pease & R. C. Bean, 26205 (G); thin soil on limestone, Cloche Bluff, McGregor Bay, July 25, 1915, F. V. Coville (US); limestone flats, Cloche Peninsula, Aug. 20, 1932, N. C. Fassett, 14885 (G); Strawberry Island, Aug. 9, 1892, W. Herriot (WH). WATERLOO Co.: dry ground near Galt, Sept. 5, 1905, J. E. Kerr (G, WH). YORK Co.: High Park, Toronto, Aug. 5, 1901, J. M. Macoun (G, NY); east Toronto, Aug. 7, 1892, C. W. Armstrong (US); on vacant lot, Babys Point, Toronto, Aug. 14, 1942, W. C. Mansell, 6453 (HB); Humber plains, near Toronto, July 28, 1898, W. Scott, 22770 (Ot); sandy soil, High Park, Toronto, Aug. 26, 1938, G. D. Darker (G); High Park, Toronto, Aug. 24, 1927, Sept. 15, 1929, Aug. 9, 1930, H. H. Brown (HB). PEEL Co.: sandy soil, Port Credit, Aug. 11, 1891, J. White, 965 (Ot). BRANT Co.: moorland ground e. of Brantford, Aug. 11, 1834, J. MacNab (P, probably isotype of *Liatris stricta* MacNab). NORFOLK Co.: moist sandy meadow, Long Point, L. Erie, Aug. 25, 1938, H. A. Senn & J. H. Soper, 552 (G, NY); Turkey Point, Sept. 4, 1927, F. L. Davis (NY); Silver Hill, Aug. 3, 1936, H. H. Brown, 5261 (HB). MIDDLESEX Co.: dry sandy woods, London, July 29, 1879, Burgess (Ot); sandy woodland, London, July 29, 1879, Sept. 30, 1882, T. Millman (To). LAMBTON Co.: near Sarnia, C. K. Dodge, Aug. 22, 1892, 11586 (Ot), 1896 (To); Port Francis, Sauble R., Sept. 1, 1883, Burgess (Ot); sandy dunes along L. Huron near Port Franks, Sept. 2, 1929, E. J. Palmer, 36258 (G); Grand Bend, Aug. 22, 1932, H. H. Brown (HB). KENT Co.: dry soil in open woods, Rondeau Park, Aug. 14, 1934, R. F. Cain, 1246 (To). NEW YORK. NIAGARA Co.: whirlpool woods, July 1877, D. F. Day (NY); Niagara Falls, G. W. Clinton (NY); bluffs of Niagara R., Aug. 19, 1875, Morong (NY). ERIE Co.:

Buffalo, *ex Herb. G. W. Clinton* (Q). MICHIGAN. CHEBOYGAN Co.: jack-pine plains, s. of Burt Lake, Aug. 22, 1920, *J. H. Ehlers*, 1263 (G), July 30, 1928, *F. C. Gates*, 15388 (US); s. of Indian R., Aug. 21, 1931, *H. A. Gleason* (NY). CRAWFORD Co.: vic. of Grayling, July 1922, *C. V. Piper* (G, US). IOSCO Co.: Oscoda, Aug. 23, 1906, *H. H. Rusby* (NY). ST. CLAIR Co.: Fort Gratiot (Port Huron), 1829, *Dr. Pitcher* (NY). WASHTENAW Co.: bank of Huron R., $\frac{1}{2}$ mi. n. e. of Cedar Bend, Aug. 19, 1935, *F. J. Hermann*, 6989 (NY); open oak slope, Cedar Bend, 1 mi. n. e. of Ann Arbor, Aug. 5, 1937, *F. J. Hermann*, 9131 (G, US); dry bank, Ypsilanti, Sept. 16, 1917, *B. F. Chandler* (US). KALAMAZOO Co.: n. w. part of Texas Twsp., July 16, 1938, *C. R. Hanes*, 288 (NY). OHIO. FRANKLIN Co.: Georgesville, Aug. 29, 1892, *W. C. Werner* (NY). ADAMS Co.: Buzzard Rock, Sept. 11, 1937, *F. Bartley & L. L. Pontius*, 611 (NY). INDIANA. LA PORTE Co.: sandhills, s. shore of L. Michigan, Michigan City, Aug. 12, 1909, *G. L. Fisher*, 14 (US). PORTER Co.: Dune Park, Sept. 25, 1914, *F. W. Johnson*, 1567 (NY); open sandy woods, Portchester, Aug. 29, 1915, *F. W. Johnson*, 2122 (US). LAKE Co.: sandy knolls, Edgmoor, Aug. 31, 1889, *L. N. Johnson* (G); Whiting, Aug. 29, 1893, *N. L. Britton* (NY); Pine, Aug. 22, 1915, *F. W. Pennell* (NY); Gibson, *O. E. Lansing, Jr.*, 3914 (G). STARKE Co.: dry gravelly hillside, e. of Bass Lake, July 24, 1906, *C. C. Deam*, 1243 (NY). NEWTON Co.: prairie area along Pa. Rwy. & road 24, 1 mi. w. of Goodland, Aug. 14, 1943, *R. C. Friesner*, 17895 (G). CLARK Co.: dry sands, Clarke, Aug. 4, 1896, *L. M. Umbach* (US). WISCONSIN. Co. undetermined: sandy pine barrens around Thunder Lake, Aug. 1884, *D. H. Hasse* (NY). PRICE Co.: bluffs of Mississippi R., Aug. 9, 1926, *P. A. Rydberg*, 9671 (NY). TREMPAULEAU Co.: Blair, 1889, *F. F. Wood* (US). ADAMS Co.: July, *I. R.* (US). JUNEAU Co.: Camp Douglas, *E. A. Mearns*, Aug. 22, 1890, 139 (US), July 16, 1890, 130 (G). COLUMBIA Co.: Dells of Wisconsin, *D. H. Hasse* (NY). SAUK Co.: pine sand barrens, Delton, Aug. 6, 1892, *R. H. True* (G); sandy bluffs of Wisconsin R., vic. of Kilbourn, Aug. 25–6, 1909 (no. 12), Aug. 28, 1909 (no. 56) *E. S. Steele* (US). MILWAUKEE Co.: Milwaukee, *I. A. Lapham* (G, NY). JEFFERSON Co.: Busseyville (F. Atkinson) 1872, *T. Kumlien* (Q). DANE Co.: s. of Madison, Aug. 30, 1893, *J. R. Churchill* (G). WALWORTH Co.: Delavan, Sept. 1887, *Mrs. J. M. Milligan* (US). ROCK Co.: Beloit, Sept. 1882, *L. H. Bailey, Jr.* (G); along the Chicago & N. W. Rwy., Clinton, Sept. 1, 1909, *E. S. Steele*, 101 (US). LAFAYETTE Co.: Fayette, Aug. 21, 1889, *L. S. Cheney* (G). ILLINOIS. Without stated locality: *Chapman* (NY), *Babcock* (G), Aug. 1872, *H. H. Babcock* (US), *Mead, ex Herb. H. P. Sartwell* (G), *Dr. Mead* (G), *Vasey*, 1873 (US), *Vasey* (G). Co. undetermined: prairies, Sept. 1837, *C. W. Short* (G, US).

LAKE Co.: dry sandy ridges, along lake shore, Waukegan, 1906, *H. A. Gleason & F. D. Shobe*, 376 (G); Waukegan, Sept. 3, 1877, *R. E. Earle* (US). McHENRY Co.: Cary, *H. C. Benke*, Nov. 18, 1932, 5615 (G, US), Aug. 11, 1928, 4803 (US). WINNEBAGO Co.: prairies, Aug. 1859, *M. S. Bebb* (G); Fountaindale, *M. S. Bebb* (NY, US). STEPHENSON Co.: hilltops, along cliffs, Freeport, Sept. 1, 1901, *C. F. Johnson* (US). COOK Co.: Riverside, Aug. 1911, *J. M. Greenman* (G); Chicago, *H. H. Babcock* (G, NY, US), Nov. 1887, *ex Herb. W. Boott* (G). DU PAGE Co.: Banks, Aug. 11, 1891, *W. S. Moffatt*, 350 (US); Pine Hills, Aug. 16, 1878, *F. S. Earle* (ND). KANE Co.: Aurora, Sept. 1884, *T. E. Boyce*, 1172 (G). HENRY Co.: Galva, 1883, *Mrs. C. N. S. Horner* (G). PEORIA Co.: dry prairies, Peoria, *F. E. Macdonald*, Sept. 1903 (G), Aug. 1903 (NY). HENDERSON Co.: prairies near Oquawka, Sept. 1875 & 1880, *H. N. Patterson* (NY); rocky hillsides, near Oquawka, 1883 (no. 15), Sept. & Oct. (no. 533), Sept. 1887 (no. 534) *H. N. Patterson* (US); Oquawka, Sept. 1876, *H. N. Patterson* (ND, Q). CHAMPAIGN Co.: dry ground, Champaign, Aug. 2, 1899, *H. A. Gleason*, 886 (G); cutting on I. C. R. R. Sept. 11, 1909, *A. S. Pease*, 12402 (G). CASS Co.: dry prairies, Beardstown, Aug. 1842, *C. A. Geyer* (G, NY). MADISON Co.: meadows e. of St. Louis, Aug. 1836, *Diehl* (NY). MINNESOTA. POPE Co.: Glenwood, Aug. 1891, *B. C. Taylor* (NY, US). HENNEPIN Co.: Fort Snelling, Aug. 7, 1909, *C. O. Rosendahl*, 2346 (G); copses, Aug. 1889, *J. H. Sandberg* (US). KANDIYOHI Co.: Spicer, Aug. 1892, *W. D. Frost* (US). WABASHA Co.: Lake City, Aug. 1883 (NY), Sept. 1883 (G), *W. H. Manning*. GOODHUE Co.: Featherstone, Aug. 1893, *A. P. Anderson* (G, US); Zumbrota, Aug. 1892, *C. A. Ballard* (US). WINONA Co.: dry open bluffs, Sept. 1905, *J. M. Holzinger* (NY); Winona, Sept. 1889, *J. M. Holzinger* (US). NOBLES Co.: dry hills, Adrian, Aug. 29, 1895, *Miss J. B. Patten* (G). IOWA. Co. undetermined: prairies, Aug. 1815, *W. W. Denslow* (NY). FAYETTE Co.: dry prairies, Aug. 1894, *B. Fink* (G), Aug. 3, 1894, *B. Fink*, 328 (US), Aug. 26, 1897, *J. R. Garraner*, 727 (NY). DUBUQUE Co.: prairies, Dubuque, Aug. *A. Morr* (G). HARDIN Co.: vicinity of Iowa Falls, Aug. 1928, *M. E. Peck*, 132 (G). MISSOURI. ST. LOUIS Co.: Meramec Highlands, Aug. 22, 1917, *J. M. Greenman*, 3833 (G, NY); St. Louis, *Drummond* (G); St. Louis prairies, July 1833, *Engelmann* (G); rocky hills, St. Louis, Aug. 30, 1875, *H. Eggert*, 143 (US); St. Louis, Aug. 30, 1875, *H. Eggert* (G, NY, US); Allenton, Aug. 25, 1883, *G. W. Letterman* (NY, US). SHANNON Co.: dry rocky woods, near Montier, Oct. 5, 1920, *E. J. Palmer*, 19295 (G); rocky woods, Montier, *B. F. Bush*, Oct. 8, 1905, 3596 (G, US), Sept. 10, 1908, 5127 (G, US), Aug. 5, 1910, 6109 (US); common in woods, Montier, Aug. 2, 1899, *B. F. Bush*, 221 (NY, ND, type of *Laciniaria nervata* Greene);

rocky woods, Montier, Aug. 4, 1927, *B. F. Bush*, 11421 (US). WRIGHT Co.: 2 mis. s. e. of Cedar Gap, July 28, 1937, *J. A. Steyermark*, 23737 (NY). GREENE Co.: dry ground, Sept. 4, 1893, *B. F. Bush*, 197 (G); thin woods, vicinity of Strafford, Aug. 27, 1912, *P. C. Standley*, 9497 (US). OZARK Co.: rocky glades above river bluffs, near Tecumseh, Oct. 8, 1927, *E. J. Palmer*, 32958 (G); Tecumseh, Oct. 9, 1927, *E. J. Palmer*, 33036 (NY). ARKANSAS. BAXTER Co.: limestone ridges, hillsides, Cotter, Oct. 28, 1913, *E. J. Palmer*, 4770 (US); dry rocky woods, Cotter, Aug. 31, 1915, *E. J. Palmer*, 8398 (US).

Liatris cylindracea was described by Michaux, from the meadows of Illinois as "tota hirsutula". Elliott (Sk. ii. 275-6 (1822?)) though including this species in his list of plants for South Carolina and Georgia "on the somewhat questionable authority of Pursh . . . questionable as regards the habitat of his species", described a glabrous plant which he had received from Dr. Torrey and which had been collected on the shores of Lake Michigan. He pointed out that: "although by a many flowered involucre, and the want of pubescence, it varies from the description of Michaux, it yet resembles his plant in too many respects to be easily separated from it". By 1841, Torrey and Gray (Fl. ii. 69), having seen more specimens, described it as: "glabrous or slightly hairy", and reported it from Missouri to Upper Canada and Michigan.

Specimens at present available from various herbaria indicate that this species is to be found mostly in the states lying along the upper part of the Mississippi River: on the west side in those approximately north of the Missouri-Arkansas state-line, and on the east side in those north of the Ohio River, including Indiana, Michigan and the southern peninsula of Ontario, and in Niagara County of New York. The specimens from Manitoulin Island in Georgian Bay, which is north of its general range in Ontario, suggest that the species had come there by way of the narrow straits from northern Michigan since it is found in Cheboygan County. It appears northward from about where *L. squarrosa* leaves off. Where the range of the two overlap, as in Missouri and southern Illinois, specimens are more frequently hirsute than in Ontario where they are generally glabrous, and this would explain Michaux's descriptive term "hirsutula", since he did not travel farther west or north than southern Illinois (see no. 6). It is also probable that intermediate forms showing a blending of

the hirsute character of *L. squarrosa* and the nonrecurved bracts of *cyindracea* occur. The two species have a common character in the pilosity on the inside of the corolla-lobes which was first noted by Nuttall, under his description of *L. squarrosa* (Gen. ii. 132 (1818)). Intermediates between the two varieties *glabrata* and *hirsuta* of *L. squarrosa* have been mistaken for *L. cyindracea* but such specimens can be recognized by the recurved bracts.

Throughout the range of *L. cyindracea* there is a diversity in the outer phyllaries, which may be less mucronate-tipped, appearing acute and more elongate. This additional varying character may have been responsible for the description by Lindley of a new species, *Liatris intermedia*, grown from roots collected in Ontario by Mr. Goldie (see discussion under no. 32), since Michaux's description of *L. cyindracea* as being "tota hirsutula" and few-flowered would indicate a different plant. From the plate, showing cylindrical buds with appressed phyllaries, there seems little doubt that *L. intermedia* is correctly placed, with numerous other Ontario collections, under *L. cyindracea*. The fact that MacNab (Edin. Phil. Jour. xix. 60 (1835)) also described under the new name *L. stricta* a plant collected in Ontario from the roadsides for several miles through the pine barrens east of Brantford, Aug., 1834 (an isotype, if not the type, was seen at Philadelphia), and that again, Thomas (Amer. Jour. Sci. xxxvii. 338 (1839)) gave a new name, *L. flexuosa*, to a specimen from the east bank of the Niagara River, seems to indicate that Michaux's phrase had limited extremely the application of his description by other authors. By comparison with a photograph of Michaux's type, seen at the Gray Herbarium, the descriptions and figures of all of these Ontario plants fit into the concept of his species as seen more frequently at the northern end of its range.

Being a species of shorter inflorescence with fewer large heads (as is *L. squarrosa* in the *Squarrosae* series and *L. ligulistylis* in the *Scariosae* series), specimens are frequently found having but one well developed terminal head. In the axils of the upper leaves of such plants, however, one or more small aborted buds are often discovered, evidence perhaps of some unsatisfactory conditions for full development of the plant and a consequent reduction in the number of heads developing, for the corm in some such specimens has been found to be partly rotted, as in

H. C. Benke, no. 5616, from Cary, McHenry Co., Ill., Nov. 18, 1932 (G, US). Also in a plant of several stems a single stem might be one-headed. Thus it seems hardly necessary to recognize the plant with a single terminal head as a variety, as did Farwell in *Lacinaria cylindracea* var. *solitaria* (Rep. Mich. Acad. Sci. xvii. 171 (1916)), or even as a form, as did MacMillan in *Laciniaria cylindracea* forma *solitaria* (Metasp. Minn. Valley 506 (1892)).

Though no report in the literature has been found of white-flowered plants of this species, one large plant was found, Aug. 21, 1940, by the writer, no. 213, at Turkey Point, Oxford Co., Ont. (G), adding one more species to the list in which albinos exist. As was frequently experienced after transplantation, the albino died at the end of the next flowering season, though other individuals persisted several years longer.

× *LIATRIS GLADEWITZII* (Farwell) Shinnars (*L. aspera* or *sphaeroidea* × *cylindracea*). Corm irregular or globose, 3–4 cm. in diameter: stems to a dozen, 4–9 dm. high, glabrous and striate below and pubescent above: leaves linear-lanceolate, punctate, glabrous to but scantily pubescent beneath, the lower up to 25 cm. long and 0.7–1.4 cm. wide, the upper reduced, narrowly linear and acute: inflorescence an open raceme, 10–30 cm. long, of ca. 6–9 heads 1–4 cm. distant: heads 20–30-flowered, on short pedicels 0.5–1 cm. long, cylindrical to slightly turbinate, 1.8 cm. long and 1–1.2 cm. wide; phyllaries glabrous, punctate, obtuse and quite closely appressed, herbaceous with a scarious purplish margin, the outer ca. 0.3 cm. in diameter, almost orbicular or ovate, erose on the margin, the middle and inner oblong, 1–1.3 cm. long and 0.5 cm. wide with more colorful and more erose margins but not becoming crisped; corolla purple, 1–1.3 cm. long, with the lobes conspicuously hairy and the tube pilose within; pappus 9–10 mm. long, short-plumose, thus rather intermediate between barbellate and plumose; achene 6–7 mm. long and blackish.—Amer. Mid. Nat. xxix. 37 (1943) (*L. cylindracea* × *sphaeroidea*). *Lacinaria Gladewitzii* Farwell, Amer. Mid. Nat. x. 43 (1926) (*Lacinaria cylindracea* × *scariosa* var. *sphaeroidea*).

Reported only from southern Ontario, Michigan and Wisconsin.—ONTARIO. KENT Co.: sandy ground, Rondeau, Sept. 5, 1931, *N. C. Fassett*, 15026 (W). LAMBTON Co.: sandy ground, pine-oak scrub, ca. 5 mi. south of Grand Bend, Sept. 6, 1942, *L. O. & W. H. Gaiser*, 243 (G). MICHIGAN. OAKLAND Co.: dry hills, Rochester, July 26, 1926, *O. A. Farwell*, 7584 (Herb. Cranbrook Inst., type). WISCONSIN. CRAWFORD Co.: dry

summit of limestone bluff, Prairie du Chien, Aug. 20, 1927, N. C. Fassett, 4478 (W).

Farwell found his type of *Lacinaria Gladewitzii* growing in association with what he called "*L. scariosa* and its variety *sphaeroidea* and *L. cylindracea*" and he stated it was an "exact intermediate between the last two".

Though neither the type specimen of *L. Gladewitzii* nor any material of what Farwell called *Lacinaria scariosa* var. *sphaeroidea* are available for examination at this time, two other collections by Dr. N. C. Fassett, referred to *Liatris Gladewitzii* by Shinnery have been seen. One of these, from sandy ground at Rondeau Park, on Lake Erie in Southern Ontario (W), was reported to be growing with *L. sphaeroidea* and the other came from limestone bluffs, in Crawford Co., Wisc. (W). Also the writer has found one plant growing with a population of *L. cylindracea* south of Grand Bend, on the south-east shore of Lake Huron, where along the sandy stretch of pine-oak woods are also to be found *L. aspera* Michx. and \times *L. sphaeroidea* Michx.

These different collections seem to bring confirmation to the occurrence of this hybrid. The specimens resemble *L. cylindracea* in the narrow, rigid, almost glabrous leaves, the open raceme-like inflorescence of comparatively few short-pedicelled heads, the appressed phyllaries and especially the conspicuous hairs on the inside of the corolla-lobes. In the characters of the stem, pubescent above, and the phyllaries, narrowly scarious and a little colorful but not at all bullate, and the pilose corolla-tube, they bear resemblances to *L. aspera* or \times *L. sphaeroidea*. The latter, as here interpreted and abounding around the Great Lakes, has become a very stabilized hybrid showing less crisped phyllaries and thus less globular and more campanulate heads than *L. aspera* (see no. 18).

(To be continued)

THE PRESUMABLE IDENTITY OF CHEILANTHES LANOSA

M. L. FERNALD

In 1803 Michaux, Fl. Bor.-Am. ii. 270 (1803), described from the mountains of Tennessee and North Carolina his *Nephrodium lanosum*:

LANOSUM. N. parvulum; elegans; totum lanosissimum: fronde oblonga, bipinnatifida; pinnis distantibus; pinnulis pinnatifidis; lobulis subrotundo-ovalibus, integris: punctis demum contiguis.

OBS. Habitus quodammodo POLYP. fontani; paulo majus.

HAB. in montibus saxosis Tennassée et Carolinae septentrionalis.

Certainly Michaux's "totum lanosissimum" and his description of the frond and especially its pinnules are promptly matched by the extremely lanate fern of the mountains of North Carolina and Tennessee which was described thirty years later as *Cheilanthes tomentosa* Link, Hort. Berol. ii. 42 (1833), . . . "stipes tomentosus . . . , pinnae . . . infra dense tomentosae", which in his full description D. C. Eaton, Ferns N. Am. i. 346, 347, rendered, "stalks . . . covered with . . . soft woolly hairs . . . The fronds . . . of a grayish color from the abundance of fine entangled tomentum." Are not these descriptions very close to Michaux's "totum lanosissimum"?

Michaux saw in his *Nephrodium lanosum* the habit of *Polypodium fontanum* of Europe, i. e. *Asplenium fontanum* (L.) Bernh., but the new American species was "a little larger". Hegi describes *Asplenium fontanum* as "Bis 25 cm hoch", i. e. 10 inches. Eaton, l. c., says of *C. tomentosa*: "The fronds vary from a few inches to over a foot in length".

On the mountains of North Carolina and Tennessee there is another species of *Cheilanthes*, which was described only one year after *Nephrodium lanosum* of Michaux. This is *Adiantum vestitum* of Sprengel, Anleitung, iii. 122 (1804).

Adiantum vestitum nenne ich eine Art, die Bosc d'Antic in Karolina fand. Sie hat einen dreyfach gefiederten Wedel, der über und über mit feinen woltichten Haaren bedeckt ist. Die Blättchen

der ersten und zweyten Ordnung sind ey-lanzetförmig; die der letzten Ordnung sind linienförmig, gekerbt und schlagen sich um die Saamenhäufchen zurück. Bosc nannte dies Farrenkraut *Acrostichum hispidum*.

Adiantum vestitum Spreng. (1804) from Carolina soon became *Cheilanthes vestita* (Spreng.) Swartz, Syn. Fil. 128 (1806) and under this name it was generally recognized in practically all works up to and through the 6th edition of Gray's Manual (1890), the *Pteridophyta* by D. C. Eaton, there (p. 681) properly described as "hirsute" and with the same characteristic illustration (pl. xvii) as had appeared in earlier editions, although these treatments may have had other species mixed with *C. vestita*. That *Cheilanthes vestita* and *C. tomentosa* are wholly distinct species no one questions; but that *C. vestita* is at all the plant clearly described as *Nephrodium lanosum* Michx., "totum lanosissimum", I can not believe. Neither did the earliest students of the group, who had the Michaux material before them. Thus, in 1804, Poiret, writing at Paris with Michaux's herbarium at hand, gave a more detailed account of the Michaux plant in Lamarck's Encyclopédie, v. 538 (1804), as *Polypodium lanosum*, although Poiret, with true French courtesy, ascribed *P. lanosum* to Michaux, a natural enough treatment since at the beginning of his long treatment of *Nephrodium* Michaux had entered "POLYPODIUM. L.". It is not necessary here to repeat Poiret's transcription of the text of Michaux (already quoted); Poiret's own additions, based obviously on the material before him, were as follows:

105. POLYPODE laineux. *Polypodium lanosum*. Michaux.

Polypodium pumilum, lanuginosum, fronde bipinnatâ; foliolis oblongis; pinnulis linearibus, lobatis, obtusis; stipite subcylindrico, ruffo. (N.)

C'est une plant peu élevée, d'un port agréable, lanugineuse sur toutes ses parties, dont les pétioles sont droits, roides, d'un brun foncé, cylindrique; un peu comprimés, garnis de folioles alternes, distantes les unes des autres, munies de pinnules opposées, presque pinnatifides, fort petites, linéaires, divisées en lobes ovales, arrondis, très-entiers. La fructification consiste en petits points épars, très-rapprochés.

Cette plante croît sur les rochers pierreux de la Caroline & dans quelques autres endroits de l'Amérique septentrionale. (V. s. *Comm. Bosc.*)
Elle a beaucoup de rapports avec le *polypodium fragrans*, Desfont.

It can hardly be affirmed that Poirét was describing something different and imagining characters not stated by Michaux, especially when the Michaux Herbarium was at his elbow. The facts that Swartz, Syn. Fil. 58 (1806), in transferring *Nephrodium lanosum* to *Aspidium* as *A. lanosum*, said "fronde tota lanosissima", while, on p. 128, in changing *Adiantum vestitum* Spreng. to *Cheilanthes vestita*, he said "frond . . . hispidulis", were corroborative, although they were somewhat literal transcripts of the original diagnoses. But, after many experiences with Michaux's species, my faith in the accuracy of André Michaux, his editor, L. C. Richard, and Poirét, who more fully described many of Michaux's plants, is so great that I place far more weight upon their descriptions than upon the confusions apparently made in the probably subsequent placing of loose labels upon the much-handled old specimens by a presumably non-botanical mounter.

A sheet in Michaux's Herbarium at Paris (a beautiful photograph taken by Mrs. Weatherby before me) contains 6 broken-off fronds which very clearly belong to *Cheilanthes vestita*, the plant with hispid or hirsute (not tomentose or lanate) fronds. This sheet has pasted on (presumably at a later date) the label of "HERB. MUS. PARIS" bearing at the bottom "Herbier de l'Amérique septentrionale d'ANDRÉ MICHAUX", and below that the label in the handwriting of André Michaux of *Polypodium lanosum*, with the "Hab. in excelsis montibus saxosis Tennessee et Carolina septentrionalis 2." The label is that of *Nephrodium lanosum*, Michaux having removed his genus *Nephrodium* from the inclusive *Polypodium* of Linnaeus subsequent to writing the label; but the sheet of 6 specimens to which it became attached is not at all of plants "totum lanosissimum". Whether in the Michaux Herbarium or in those of Lamarck or of Poirét there is a Michaux sheet with very lanate fronds is an academic question which may sometime be settled. Certainly the sheet of specimens with the labels does not contain the plants which Michaux (or L. C. Richard) and, afterward, Poirét described.

Such mixtures of labels, added to sheets which had apparently earlier been mounted, are occasional through the Michaux and other old Herbaria. In my own work with other groups I have sometimes noted them.¹ Since the sheet which now bears Michaux's label "*Polypodium lanosum*", etc. has 6 fronds, it is significant that when D. C. Eaton studied Michaux's material in 1866, he stated that there were "five medium-sized fronds" (D. C. Eaton in *Canadian Naturalist*, v. 26 (1870)). It is evident that Michaux's Herbarium has had more than a single sheet which has passed as *Nephrodium lanosum*. I can not subscribe to the argument that, when Michaux and then Poiret described a plant as "totum lanosissimum" they really meant one which is merely hispid and not at all lanate.

The first few species described from eastern North America of what is now the genus *Cheilanthes* were hopelessly misunderstood. These confusions were specially concentrated in the late 50's of the last century. Thus, in his *Species Filicum*, ii. 98 and 99 (1852), Hooker described as "*Cheilanthes* 'vestita, Sw.?' " (the interrogation indicating his doubt) and illustrated (his t. CVIII. B) a fern with "stipites . . . as well as the main rachis . . . laxly woolly, fronds . . . at the margins beneath and on the partial rachis, densely woolly the wool more or less tawny". As synonyms he gave (1) *Cheilanthes lanuginosa* Nutt. (an herbarium-name which was later, through Nuttall's material, identified with the western *C. Feei* Moore, based on *Myriopteris gracilis* Fée, not *Cheilanthes gracilis* Kaulf. (1824); (2) *Nephrodium lanosum* Michx. (1803), with the derived binomial *Aspidium lanosum* Sw., just as he had included the original *Adiantum vestitum* "Spreng. *Anleit.* iii. p. 122". The latter reference was quoted and the identity of the "densely woolly" "*Cheilanthes vestita*" was doubted by Hooker because he had not seen and seems rather to have doubted Swartz's correct description and Schkuhr's accurate illustration of it. Hooker said (p. 99): "What we here describe and figure as *Cheilanthes vestita* is . . . no doubt the *Nephrodium lanosum* of Michaux, Fl. Bor. Am. (1803), and he properly describes the fronds as 'lanosissimae'. Swartz, however, who adopts Sprengel's (prior?) specific name,

¹ For example see plate 1045 in RHODORA, xlviii. (1946) with the label over, instead of beneath the base of the leaf.

vestita, given in a work to which I have no immediate access, describes the fronds as *hispidulous*. Schkuhr adopts the same term, and figures a plant, the under side of which gives no idea of the really woolly nature of the frond; having, moreover, entire oblong pinnules, with a solitary terminal involucre". Michaux was correct in describing one plant, the lanate *C. lanosa* (Michx.) D. C. Eaton; Sprengel and Schkuhr were as vividly (even to the involucre as shown by Schkuhr) correct in describing another species, *C. vestita* (Spreng.) Swartz!

It is needless for one who is not a pteridologist and who is helpless in trying to understand all those who are, to follow all the subsequent confusions, but at least one other must be noted. This was D. C. Eaton's abbreviated and rather confused paragraph, without a word of description, in Torrey's *Botany of the Mexican Boundary*, 234 (1859), where the combination *Cheilanthes lanosa* was based on a doubted basonym, with at least two other synonyms involved, thus giving us the now supposedly sacrosanct combination which has been in vogue for half a century, *C. lanosa*, for a plant which is not lanate! Here is Eaton's paragraph:

CHEILANTHES LANOSA. *C. vestita*, Hook. l. c. p. 98, t. 108, B. *Nephrodium lanosum*, Michx. Fl. Bor.-Am. 2, p. 270? *Myriopteris gracilis*, Fée, l. c. p. 150, t. 29, f. 6. Along the Rio Grande; Wright. The name of *C. vestita* unquestionably belongs to the fern described and figured by Professor Gray under that name in the *Manual*, (2d. ed.) p. 592, t. 10.

Embarrassingly enough, the last item is the only one that was well founded. Eaton, although making the transfer, doubted the identity with the others of the Michaux plant; *Myriopteris gracilis* is by all students now considered a separate species, *Cheilanthes Feei* Moore, while the plant of Charles Wright, which inspired the paragraph, was later identified by Eaton, in his *Ferns of N. Am.* i. 41 (1878) as *C. lanuginosa* Nutt. (originally a synonym only of Hooker's confused *C. vestita*, but validated in 1863 by D. C. Eaton, although this was later than *C. Feei* Moore (1857) which, I am told, is the same species).

In his *Ferns of N. Am.* l. c. 13-15, Eaton got identities more straightened out, for he correctly took up the name *Cheilanthes vestita* for the plant with "fronds . . . hirsute . . . ; . . . the

ends of the roundish or oblong lobes reflexed, and forming separate herbaceous involucre". But he still kept in its synonymy the perpetually misinterpreted *Nephrodium lanosum* Michx. ("totum lanosissimum") with the first unequivocal name for it under *Cheilanthes*, "*Cheilanthes lanosa*, D. A. WATT, in Journal of Botany, February, 1874, p. 48: not of Moore, Index Fil., p. 245, nor of Eaton, Mex. Boundary Botany, p. 234, which synonyms belong to *Ch. lanuginosa*, Nuttall". On page 15, arguing for the retention of "well known" names, he said "Michaux's name, *Nephrodium lanosum*, is undoubtedly the first published of the various names for this fern [*C. vestita*, with the characters as originally given by Sprengel and by Swartz] . . . Usually it is well to keep the oldest specific name when it is known; but . . . to endeavor to replace well-known specific names by older, but obscurer ones, is surely reprehensible".

I have been told that it is "reprehensible" to displace the name *Cheilanthes tomentosa* Link (1833) by *C. lanosa* (Michx.) D. C. Eaton (1859), based on *Nephrodium lanosum* Michx. (1803), for the former name is "established", while the name *C. lanosa* has (erroneously) "become established" for *C. vestita* which is not lanose! I can hardly subscribe to this philosophy, even though Michaux's label got affixed, probably after his death, to a sheet of specimens which lacks the characters given by him, and in more detail by Poiret, from the original and perhaps now lost lanate specimens. For quite as long a period, through the 6th edition of Gray's Manual, the name *C. vestita* was correctly used for the hirtellous species. When it was "reprehensibly" displaced, through error, by the name *C. lanosa* established usage of that period was certainly (and unjustifiably) upset. It seems to me that the name CHEILANTHES LANOSA (Michx.) D. C. Eaton (1859), based nomenclaturally on *Nephrodium lanosum* Michx. (1803), should replace *C. tomentosa* Link (1833), if the original descriptions mean anything.

SOME TRIVIAL AMERICAN FORMS OF THE
LADY-FERN

M. L. FERNALD

Most of the so-called "varieties" of *Athyrium Filix-femina* (including *A. angustum* (Willd.) Presl and *A. asplenoides* (Michx.) Desv.) have already been properly transferred to formal rank but the few which follow seem to require such transfer. My apology for so treating them will be found in the discussion below.

ATHYRIUM FILIX-FEMINA (L.) Roth, var. MICHAUXII (Spreng.) Farwell, forma **laurentianum** (Butters), stat. nov. *A. angustum* (Willd.) Presl, var. *laurentianum* Butters in RHODORA, xix. 194 (1917).

A. FILIX-FEMINA, var. MICHAUXII, forma **confertum** (Butters), comb. nov. *A. angustum*, forma *confertum* Butters, l. c. 195 (1917). *A. angustum*, var. *confertum* (Butters) C. S. & W. F. Lewis in Am. Fern. Journ. xi. 83 (1921).

A. FILIX-FEMINA, var. MICHAUXII, forma **laciniatum** (Butters), comb. nov. *A. angustum*, forma *laciniatum* Butters, l. c. (1917).

A. FILIX-FEMINA, var. ASPLENIODES (Michx.) Farwell, forma **subtripinnatum** (Butters), comb. nov. *A. asplenoides* (Michx.) Desv., forma *subtripinnatum* Butters, l. c. 190 (1917).

For once I fully agree with the late O. A. Farwell, who reduced *Athyrium angustum* and *A. asplenoides* to varietal rank under *A. Filix-femina*. It seems to me quite impossible to keep apart on any stable morphological characters the circumboreal *Athyrium Filix-femina* and its two commoner eastern American representatives, *A. angustum* and *A. asplenoides*. Attempts to keep apart the two latter in the area where their ranges overlap are futile, this difficulty already noted by Weatherby in Am. Fern. Journ. xxvi. 134 (1936), where, considerably maintaining the three species recognized by Butters (*A. Filix-femina*, *angustum* and *asplenoides*), he wrote as follows:

But his three species are very closely related, often much alike in general aspect and not always easy to distinguish. The two of eastern North America [i. e. *A. angustum* and *A. asplenoides*, for *A. Filix-femina*, either typical or as var. *sitchense* Rupr. grows on the Gaspé Peninsula and in Newfoundland as well as elsewhere in the East] are comparatively readily recognizable in the north and in the south where each is the exclusive occupant of its area; but in the region from southern New England to about the Potomac valley, where both

occur, they intergrade freely and in most perplexing fashion. All three would perhaps be better treated as geographic varieties of a single species, roughly analogous to those of *Cystopteris fragilis*.

In this connection it is significant that the indusia shown by Butters, l. c., in his plate 123 and in his figs. 3C and 5A and B, for *Athyrium Filix-femina* are rather extreme. The figures of European indusia given by Schkuhr in his *Kryptogamische Gewächse*, t. 58, by Hooker fil. in his *British Ferns*, t. 35, by Britten in his *European Ferns* (colored plate opp. p. 131) and by many others are reminiscent of indusia of *A. angustum*. Furthermore, when he made his study of the group, or later, in checking identifications in 1932, Butters clearly wrote on a few sheets from eastern Canada and Maine such notes as "This appears to be true European *A. Filix-femina*—F. K. B.", such embarrassing specimens coming from the Mingan Islands and Lake St. John, Quebec, and from Mt. Desert Island, Maine. The Mingan sheet (*Victorin & Rolland*, no. 24,616) had been distributed as *A. angustum*, var. *laurentianum*. The latter anomalous plant in its compact and often strongly ascending rhizome and its very short lower pinnae is superficially so close an imitation of small European plants that it is most difficult to view it as belonging to a separate species. In fact, when real pteridologists (to which highly specialized brotherhood I hardly belong) got hold of this form they wrote (Weatherby & Adams, *List Vasc. Pl. Grand Manan—Contrib. Gray Herb.* no. clviii. 21 (1945)) under *Athyrium angustum*: "Most of the specimens seen belong to the form distinguished as var. *LAURENTIANUM* Butters. Here they tend to be rather strongly cespitose, the stipes short and the blades conspicuously narrowed toward the base, thus approximating in appearance true *A. Filix-femina* of Europe." I fully concur, and only on very plastic characters can such plants be kept apart from European material. In 1932 Butters evidently thought so.

In Europe many scores of trivial forms have been treated as "varieties", but in Hedwigia, xlv. 119–123 (1906), Goldschmidt treated them as subvarieties and forms. This sane course is approved by Bergdolt in Hegi, Ill. Fl. Mitteleur. i. 48, he saying "Alle diese Varietäten werden noch in zahlreiche Subvarietäten und Formen aufgeteilt". In view of the great diversity of forms

assumed by the Lady-fern, the suggestion of the late James Britten (a crusty bachelor) that, in transferring the name *Filix-femina* from the bracken to the present species, Linnaeus perhaps had in mind the French proverb "Souvent femme varie", etc., is pertinent (or impertinent)!

CENTAUREA MACULOSA IN INDIANA.—According to Deam in his "Flora of Indiana", A. A. Hansen reported this species as a weed near Atlanta in Hamilton Co., near the center of the state (Proc. Ind. Acad. Sci. 36: 251. 1927). Deam, although listing the plant in his "excluded species", states that it may become established soon if it has not already done so. Later, E. E. Sherff (RHODORA 48: 98. 1946) takes note of Deam's remarks, and states that this species seems thoroughly established in adjacent southern Michigan.

September 22, 1941 I found a solitary plant on Route 20 in Porter Co., approximately 20 miles from the Michigan boundary. In a subsequent year I found another single plant on the same road, same county, about a mile west from the first. This region I looked over thoroughly in 1946, but no plants were found. August 27, 1946 I found several plants in the locality where the first was seen, apparently well established and able to compete successfully with any roadside weeds.

Specimens have been sent to the Gray Herbarium.—EDWIN D. HULL, Gary, Indiana.

SETARIA FABERII IN NORTH CAROLINA.—In the interest of tracing the rather rapid spread of the Asiatic grass, *Setaria Faberii* Herrm., in North America, it may be worth while to record this species for the first time in North Carolina. On August 5, 1946, while driving northwestward across the piedmont of North Carolina, I happened to glimpse the characteristic panicles of *S. Faberii* along Route 54 at Cane Creek in Orange County. Stopping to collect material, I found many scattered plants of the grass in a weedy roadside field with abundant *Lespedeza stipulacea*, the latter presumably planted intentionally and the former possibly introduced at that time.

Dr. H. L. Blomquist, to whom I sent material of this collection, upon examination of the specimens recalled collecting a robust *Setaria*, the arching panicles of which had attracted his attention, along U. S. Route 70 at Cherry Point in Craven County on August 23, 1945. Since at that time he was busy with other matters, the specimens had been stored away for future study. Examination proves this material also to represent *S. Faberii*.

At least these two collections, 150 miles apart, represent the grass in North Carolina. Whether or not it is permanently established in the state remains to be seen. Dr. Blomquist writes me that he did not see the species at Cherry Point in the summer of 1946. However, if it behaves in North Carolina in the same way as it has in western Virginia and in southeastern Pennsylvania and adjacent New Jersey it will soon become a well-established weed in recently disturbed soils. As H. A. Allard pointed out in reporting the grass from northern Virginia,¹ it does not seem to be able to compete with other species in ground which is not repeatedly disturbed, becoming then dwarf or disappearing altogether. In favorable places, however, as in rich bottomland corn fields, the plants may often reach a height of more than six feet.

The Craven County collection, *Blomquist 13722*, and that from Orange County, *Wood 6532*, are represented at the Gray Herbarium, the U. S. National Herbarium, the University of Pennsylvania and Duke University.—CARROLL E. WOOD, JR., Gray Herbarium.

¹ Va. Journ. of Science 2: 119. 1941.

Volume 48, no. 574, containing pages 265-328, was issued 19 October, 1946.

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